

SPILLS ACTION CENTRE
SUMMARY REPORT OF
1990 OCCURRENCES

JUNE 1992



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Environment
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SUMMARY REPORT OF 1990 OCCURRENCES

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JUNE 1992



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SPILLS ACTION CENTRE SUMMARY REPORT OF 1990 OCCURRENCES

EXECUTIVE SUMMARY

This report summarizes occurrences reported to Environment Ontario's Spills Action Centre (SAC) during the 1990 calendar year. It also provides several comparisons to previous years in an attempt to identify significant trends.

In 1990, 15,774 occurrences were reported to SAC and documented on the Ministry's Occurrence Reporting Information System (ORIS). These included: 5,686 environmental spills; 5,419 occurrences classified as notifications (Ministry required notifications other than spills); 4,068 environmental complaints from the public; and 601 occurrences classified as others.

Just over half the spills reported to SAC in 1990 involved oils or fuels. Chemicals or chemical solutions, wastes or wastewaters and gaseous spills accounted for the other half. A large portion of these reported spills involved small quantities: about 18% were less than 10 litres, 51% were less than 100 litres and 83% were less than 1,000 litres.

Less than 10% of the 5,686 environmental spills had a confirmed impact identified. Two-thirds of these involved soil contamination, while the bulk of the remainder involved surface water contamination. Only 13 had impacts on human health or safety, while 10 had confirmed adverse effects on wildlife.

Spill cleanup information in this report indicates that spills to land are normally easier to clean up than spills to water, while spills to air--because they usually involve escaped gases--are virtually impossible to clean up. About half of the spills to land were completely cleaned up and 80% were more than half cleaned up. By comparison, less than 20% of spills to water were cleaned up to any extent and no cleanup was undertaken on any spills to air.

The industrial sectors with the largest number of reported spills were: transportation (14.7%); petroleum (12.5%); chemical (10.8%); and metallurgical (8.4%). Combined public sector spills, such as those from hydroelectric utilities and sewage treatment systems, accounted for about 20% of reported spills.

Almost one-third of the 5,686 spills reported were either entirely or partly discharged to water. Of these, 333 involved oil or chemical discharges to the Great Lakes System, including: 111 to Lake Ontario, 73 to the St. Clair River, 67 to the St. Lawrence River and 26 to Lake Erie. The remainder were spills to Lake Superior, the Detroit River, Lake Huron, the St. Mary's River, the Niagara River and Georgian Bay.

Comparison to previous years

Occurrences reported to SAC increased about 20% each year between 1986 and 1989. This trend changed in 1990 when 87 fewer occurrences were reported than in 1989. The drop in occurrences is attributed to a decrease in environmental complaints and fewer occurrences documented as others. The number of environmental spills reported to SAC in 1990 actually increased by 6.4% over 1989. This increase is small compared to a 31.3% increase in reported spills from 1988 to 1989.

How this data is used

Occurrence summaries presented in this report, along with additional information from the ORIS database, assist the ministry and others, such as Environment Canada and the International Joint Commission on the Great Lakes, in identifying and responding to environmental problems.

Ministry pollution abatement programs and spill reduction initiatives are developed or modified as trends or concerns are identified using this type of information. For example, the Ministry has implemented a province-wide spills prevention strategy requiring repeat spillers to submit spill prevention and response plans to the Ministry and to incorporate better management practices. About 30 companies are currently involved in this process.

INTRODUCTION

This report provides a summarized review of the occurrences reported to Environment Ontario's Spills Action Centre (SAC) during the calendar year of 1990. Part I of the report deals with all occurrences reported to SAC while Part II focuses on spills. Part III provides additional information on spills to the Great Lakes.

The Centre began operations on November 29, 1985, the same day that Part IX of the Environmental Protection Act ("Spills Bill") came into force. SAC operates a province-wide toll-free number for receiving reports of spills and other urgent environmental matters on a 24 hour-per-day basis. SAC environmental officers evaluate all occurrences reported to them and decide the appropriate action to be taken. This may include the following:

- Contacting suspected problem sources in an attempt to verify and resolve the problem;
- Contacting local Ministry of the Environment (MOE) personnel to initiate a field response when necessary;
- Contacting other agencies or potentially affected parties as needed, for example, police, fire departments, ambulance, local municipal authorities, Coast Guard, US authorities, etc.;
- Notifying senior MOE management if the incident is serious, and co-ordinating information flow to the public;

- Contacting the Minister's office and conveying orders or directions from the Minister where necessary;
- Maintaining liaison with the agencies in charge of public safety in an emergency and co-ordinating MOE's support for their efforts;
- Providing ministry staff and others with information on chemicals and cleanup techniques, either directly or through CANUTEC, Transport Canada's national 24-hour centre;
- Recording the details of non-urgent incidents and sending them to the appropriate district office or other agencies for response during normal business hours.

Regardless of what action is initiated, all occurrences are recorded on a computerized data management system. Each occurrence is classified into one of four categories: Spills, Notifications, Complaints, or Others (these categories are described in detail in Part I of this report). Since January 1, 1988 all incidents reported to SAC have been documented on a relational data management system which is called the Occurrence Reporting Information System (ORIS). The system enables the Ministry to track the status of occurrences and facilitates routine summaries and non-routine data searches. Each occurrence record consists of a text summary identifying the main elements of the incident. Several fields are coded to facilitate data retrieval. A sample occurrence report is included in Appendix I and a listing of coding categories used for ORIS is included in Appendix II.

The information presented in this document represents SAC's third calendar year summary of ORIS data. While the summaries presented have gone through numerous checks and balances they should not be viewed as being absolute or error free. Information that comes

in during spills and emergencies is not always exact and frequently changes. SAC environmental officers are required to exercise discretion when entering codes or other data relating to an occurrence. Since ORIS is a relational database, any updates made to occurrence data will affect the currency of past data summaries. Therefore, to a certain extent the information presented in this report is a "snapshot" of the information that existed on the system at the time summaries were generated.

PART I

OCCURRENCES IN GENERAL

The Spills Action Centre was established in anticipation of a greater number of reportable spills resulting from tougher spills legislation and an overall increase in environmental awareness. As SAC's province-wide, toll-free number has become better known, it has been used increasingly not only for reporting spills but also for numerous other environmental matters. This part of the report reviews all of the occurrences reported to SAC in 1990. Part II and III will focus specifically on spills.

TYPES OF OCCURRENCES

All occurrences reported to SAC are classified into one of the following four occurrence categories:

Spills: Part IX of the Environmental Protection Act defines a spill as a discharge of a pollutant which may have adverse effects, into the natural environment, where the discharge is from a container or structure and is abnormal in light of all circumstances. A spill must be reported and cleaned up if it causes or is likely to cause adverse effects.

Notifications: This category, which is sometimes referred to as "notifiable discharges other than spills", is used to classify a range of ministry notifications, including reports to the Ministry required through legislation or regulation such as Sections 12 and 14 of the Environmental Protection Act, or Section 9 of Regulation 308. Also included are reports made as a condition of operation in a Certificate of Approval, or other conditions

of operation which require a facility to report certain deviations in operations or fluctuations in discharges of contaminants. Notifications made in accordance with interjurisdictional agreements are also included in this category. It is important to note that the distinction between the spill category and the notification category is not always clear and some notifiable discharges may be borderline or quasi-spills. In fact, during SAC's first year of operation, the two categories were grouped together and both referred to as spills. However, since March 1987 SAC has applied the more rigorous definition of a spill found in Part IX of the Environmental Protection Act, and the notification category has been kept separate. The spill and notification categories combined are sometimes referred to as "reportable occurrences".

Complaints: These are reports received from the public which involve environment related problems or concerns. Complaints are often directed at specific pollution sources and include expressions of concern over noise, odour, dust, smoke, etc. The vast majority of all complaints documented at SAC are received during the hours when local Ministry offices are closed.

Others: Occurrences which do not fall into the preceding categories are classified in this category. These include occurrences such as a hazardous material release that was contained in a building or spilled inside an enclosed truck (i.e., NOT released to the natural environment), or reports of spill training exercises. SAC also makes use of this category to track the status of data requests.

MINISTRY RECORDS

SAC is responsible for maintaining spill records for the entire Ministry. Spills may be reported to the Centre in one of two ways. First, they may be reported directly by the discharger, other government agencies, or the public, which accounts for the majority of spills reported. Second, they may be reported indirectly via other ministry offices. Ministry staff who receive spill reports are instructed to relay the relevant information to SAC as soon as possible to ensure staff at the Centre are aware of the incident, and to allow for prompt documentation. Therefore, spill summaries presented throughout this report represent all spills reported to the Ministry.

SAC does not maintain complete Ministry records for complaints, notifications or other occurrences handled by the Ministry, since such record keeping is primarily the responsibility of each district office. These types of occurrences are reported to SAC primarily during "off-hours" when the district offices are closed. Complaints and notifications being reported during regular business hours and received directly by the district offices are not forwarded to SAC. As a result, SAC records do not reflect Ministry totals for these categories. Therefore, the non-spill summaries presented in this report (e.g. complaints and notifications) do not reflect complete Ministry totals.

OCCURRENCE SUMMARIES

The summaries presented in this report are based on the date the occurrence was reported to SAC. If a spill occurred in 1989 but was not reported and documented at SAC until 1990, then it appears in the 1990 Summary Report. The occurrence date is not used as the basis for summaries because, for some incidents, the date of occurrence is not known. All spill incidents reported by telephone or fax to SAC are entered into the ORIS database the same day they are reported. Spills reported to SAC after the fact, via subsequent ministry

field reports, are entered on a lower priority basis. For these reports, the differences between the date of occurrence, date reported to MOE and date reported to SAC can be significant. Of the 5,686 spills which are documented in this 1990 summary, 93 (1.6%) actually occurred in 1989 but were not entered into the database until 1990.

This part of the report makes use of five figures and one table to summarize the nature and trends of occurrences reported to SAC. The information presented by these illustrations is outlined in the following series of paragraphs. The actual illustrations appear sequentially after the text.

The increase in the total number of occurrences reported to SAC from 1986 to 1990 is shown in Figure 1. It shows a steady increase in reported occurrences during the first four years that SAC was in operation. However, the 1989 and 1990 results suggest that reported occurrences have levelled off at between 15,000 and 16,000 per year. Figure 2 provides a breakdown of occurrence by types for three calendar years - 1988, 1989 and 1990. It shows that while spill reporting increased slightly from 1989 to 1990 the rate of increase has gone down substantially; that is, the rate of increase of spill reporting from 1988 to 1989 was 31.3%, while the corresponding increase from 1989 to 1990 was only 6.4%. The total numbers of notifications, complaints and other reported occurrences decreased in 1990 compared to the 1989 totals, as shown in Figure 2.

Figure 3 provides a breakdown of occurrences by type for 1990; spills accounted for 36% of the total, notifications 34%, environmental complaints 26%, and other occurrences accounted for 4%. In total, 70% of all occurrences dealt with by SAC required reporting and can be considered reportable occurrences.

Table 1 provides a breakdown, by MOE Region and District, of all occurrences documented by SAC. These results are shown graphically in Figure 4. The large number

of notifications shown in Figure 4 for the Hamilton district are related to the areas' steel making operations.

Seasonal fluctuations in the four occurrence categories reported to SAC in 1990 are shown in Figure 5. As was the case in previous years, it can be seen that SAC dealt with more occurrences during the warmer months than during the colder months. The pattern, to a large extent, is due to an increase in environmental complaints received during the warmer months when a greater number of people are involved in outdoor activities and more likely to observe environmental problems.

Additional information on the off-hour complaints to the Ministry received by SAC is presented in Appendices III, IV and V.

Figure 1
Occurrence Totals By Year

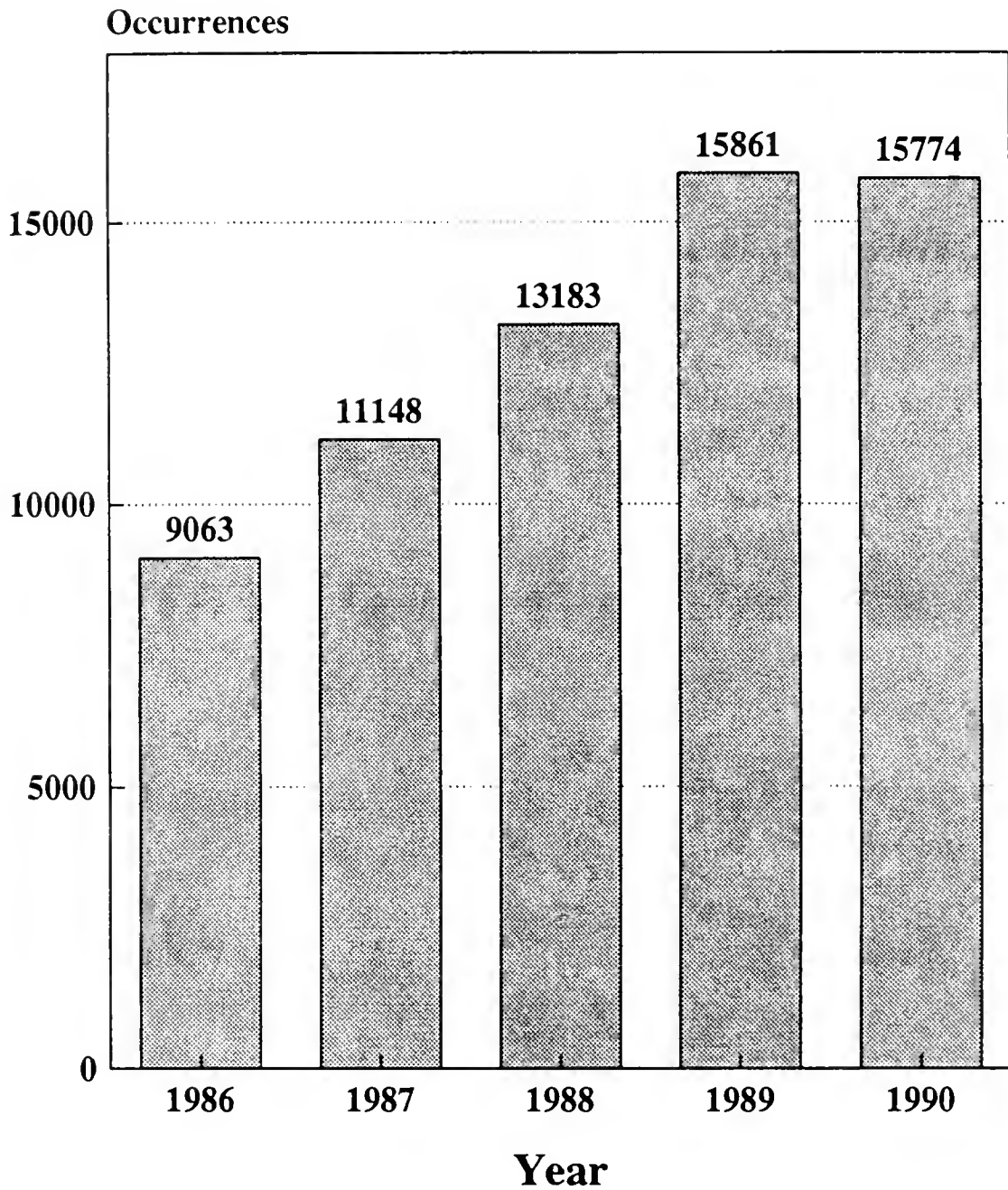
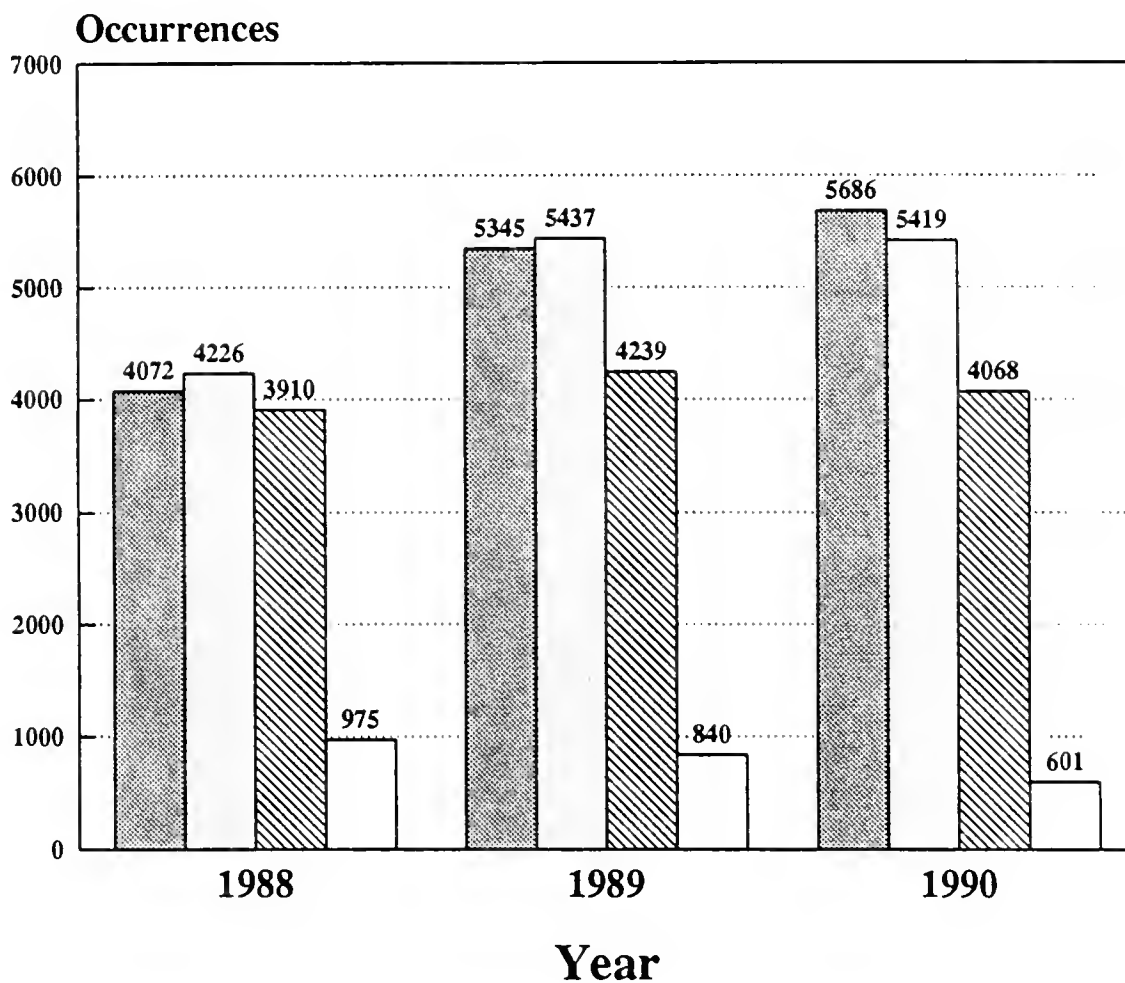


Figure 2
Occurrences By Type and Year



OCCURRENCE TYPE



Spills



Notifications



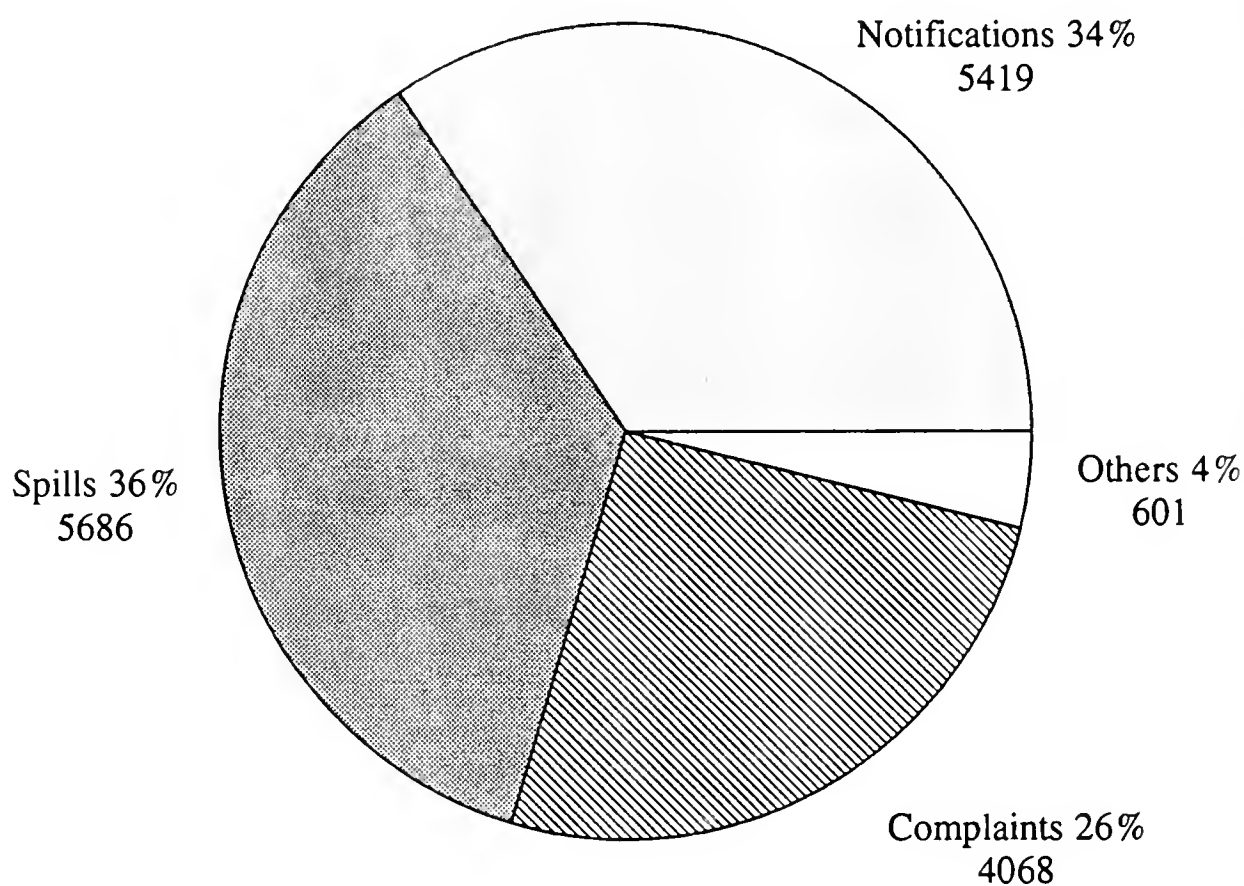
Complaints



Others

Figure 3

Occurrence Totals



A total of 15 774 Occurrences
were reported to SAC in 1990

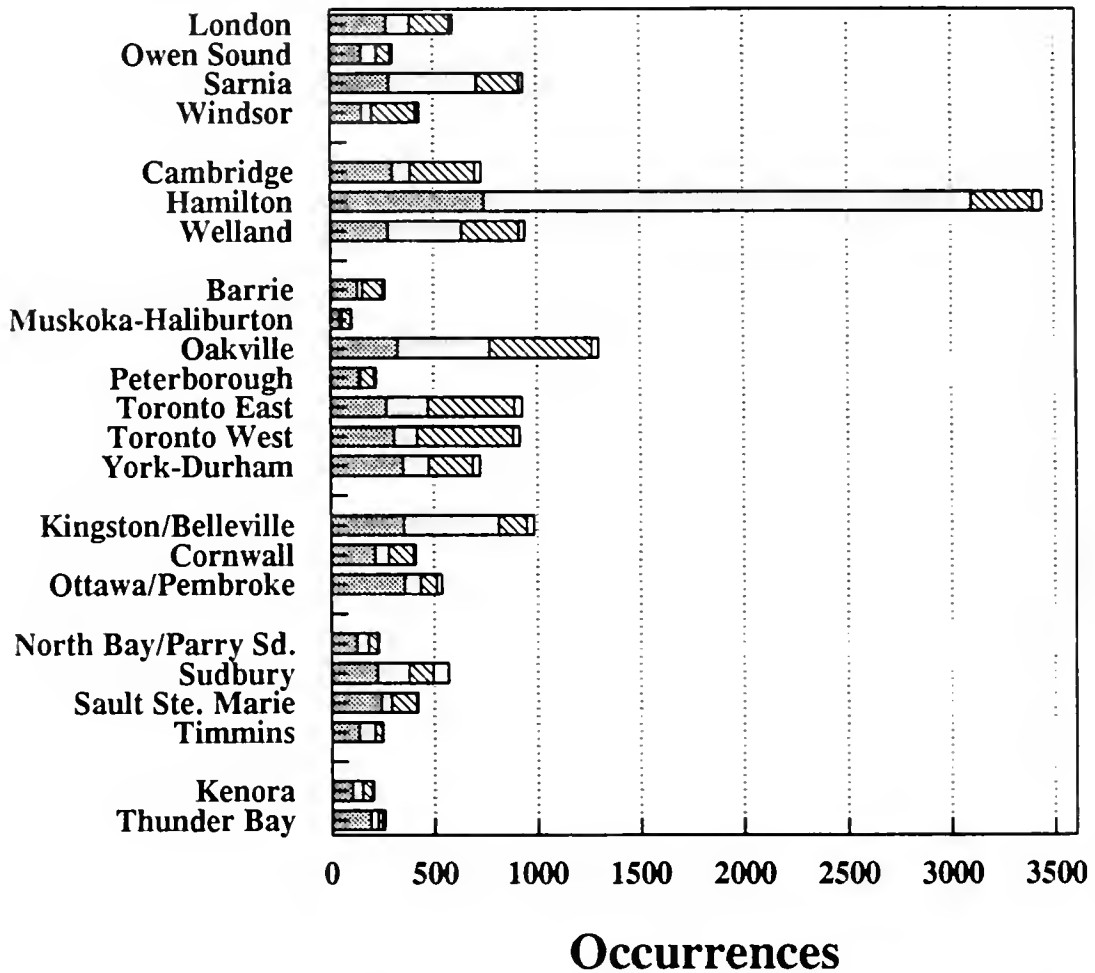
TABLE 1

REGIONAL BREAKDOWN OF ALL OCCURRENCES REPORTED TO SAC

REGION	DISTRICT	OCCURRENCE TYPE				TOTAL
		Spills	Notifi- cations	Complaints	Others	
Southwest	London	274	114	191	17	596
	Owen Sound	151	77	62	13	303
	Sarnia	285	425	206	21	937
	Windsor	154	48	211	18	431
	SUB-TOTAL	864	664	670	69	2267
West Central	Cambridge	302	85	315	31	733
	Hamilton	743	2356	298	42	3439
	Welland	279	356	278	29	942
	SUB-TOTAL	1324	2797	891	102	5114
Central	Barrie	132	24	96	13	265
	Muskoka - Haliburton	42	14	44	4	104
	Oakville	325	445	496	31	1297
	Peterborough	135	12	65	8	220
	Toronto East	269	203	418	36	926
	Toronto West	307	113	465	30	915
	York-Durham	351	125	213	33	722
	SUB-TOTAL	1561	936	1797	155	4449
Southeast	Cornwall	215	65	120	8	408
	Kingston	354	458	138	33	983
	Ottawa	357	75	79	24	535
	SUB-TOTAL	926	598	337	65	1926
Northeast	North Bay	125	56	41	7	229
	Sudbury	222	155	115	75	567
	Sault Ste. Marie	241	51	119	9	420
	Timmins	133	79	32	4	248
	SUB-TOTAL	721	341	307	95	1464
Northwest	Kenora	100	49	45	7	201
	Thunder Bay	190	34	21	14	259
	SUB-TOTAL	290	83	66	21	460
SAC	Data Requests	0	0	0	94	94
ALL	TOTAL	5686	5419	4068	601	15774

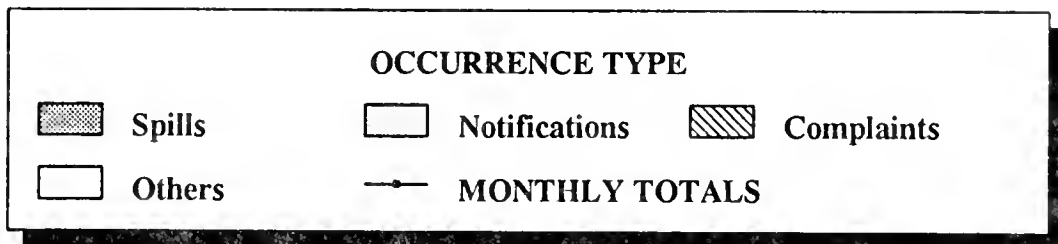
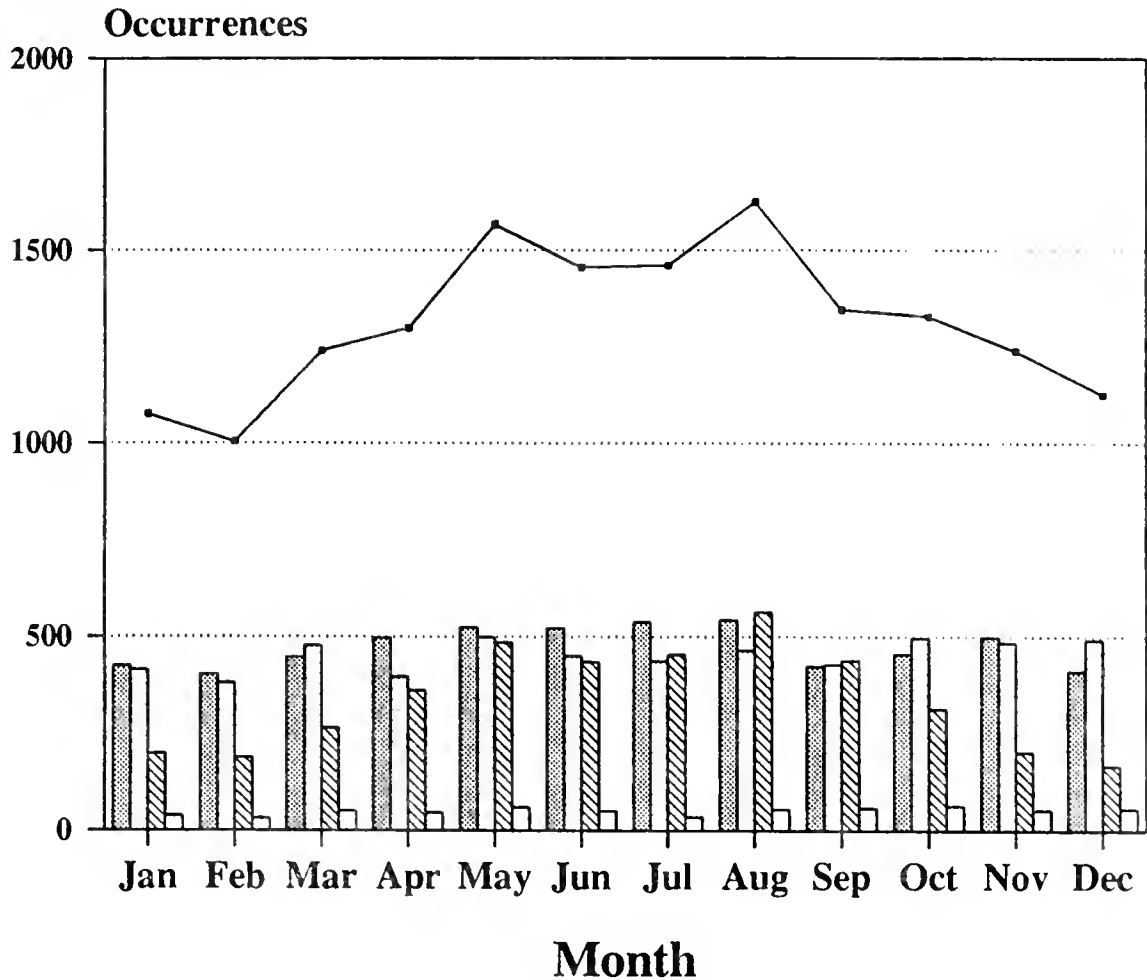
Figure 4 Occurrences By Type & District

MOE District



Reported Occurrences: 15 774

Figure 5
Occurrences By Type & Month



PART II

SPILLS

This part of the report provides a more detailed review of the number and type of spills reported to SAC in 1990. It also provides some comparisons to the spill results obtained in 1988 and 1989. The various spill related categories presented in this report are generally consistent with those used by Environment Canada in their National Analysis of Trends in Emergencies System (the NATES program). The NATES codes were originally developed in an attempt to standardize spill reporting results across the country and facilitate the exchange of spill related data. To the extent practicable, Ontario has adopted the NATES coding categories.

SPILLS TO AIR, LAND AND WATER

Table 2 summarizes spills by medium (i.e. spills to air, land, and water) as well as multiple media spills. It also provides a comparison to the 1988 and 1989 results. While the number of spills in each category has increased from 1988, the relative percentages of each category for each calendar year are quite similar.

There were 649 spills to air in 1990. Releases to the atmosphere which have been classified as notifications, such as sulphur dioxide exceedences or minor releases during changes in industrial operating conditions, are excluded from this total.

The spills to land category accounts for the largest portion of spills - 55.3% or 3,144 spills. Most spills to land are readily cleaned up using the resources of the discharger, clean-up contractors, co-operatives, or municipalities. This topic is discussed in more detail in the section dealing with spill cleanup.

TABLE 2
SPILLS BY MEDIUM

SPILLS RELEASED TO	1990		1989		1988	
	SPILLS	%	SPILLS	%	SPILLS	%
Land	3144	55.3	2996	56.1	2261	55.5
Water	1305	23.0	1135	21.2	969	23.8
Air	649	11.4	776	14.5	543	13.3
Land and Water	467	8.2	355	6.6	243	6.0
Air and Land	98	1.7	75	1.4	51	1.3
Air and Water	23	0.4	8	0.2	5	0.1
TOTALS	5686	100.0	5345	100.0	4072	100.0

There were 1,305 occurrences which were documented as spills to water in 1990. This number excludes all of the minor contaminant exceedences to watercourses, which are required to be reported to the Ministry as conditions of operation. Such occurrences are documented as notifications and therefore do not appear in the spill summaries.

The spills to water category in Table 2 includes 333 spills of oils, chemicals, or chemical solutions, discharged directly to the Great Lakes and interconnecting channels during 1990. A more detailed review of oil and chemical spills to the Great Lakes is provided in Part III of this report. These are dealt with separately and in more detail because of the significance of the Great Lakes System to Ontario and the Ministry's commitment to provide certain information to the International Joint Commission on the Great Lakes.

TYPES OF MATERIALS SPILLED

Table 3 is a tabulation of spills by material type and MOE region. The total number of materials spilled (5,991) exceeds the total number of spills reported to SAC in 1990 (5,686). This discrepancy is attributable to a number of spill occurrences which involved two or more spilled materials.

Oils constitute 52.5% (3,144) of all reported spilled materials. Gasoline, fuel oils and light petroleum oils account for most of these with many being operating fuels discharged as a result of transportation accidents or fuel leaks from fixed storage facilities.

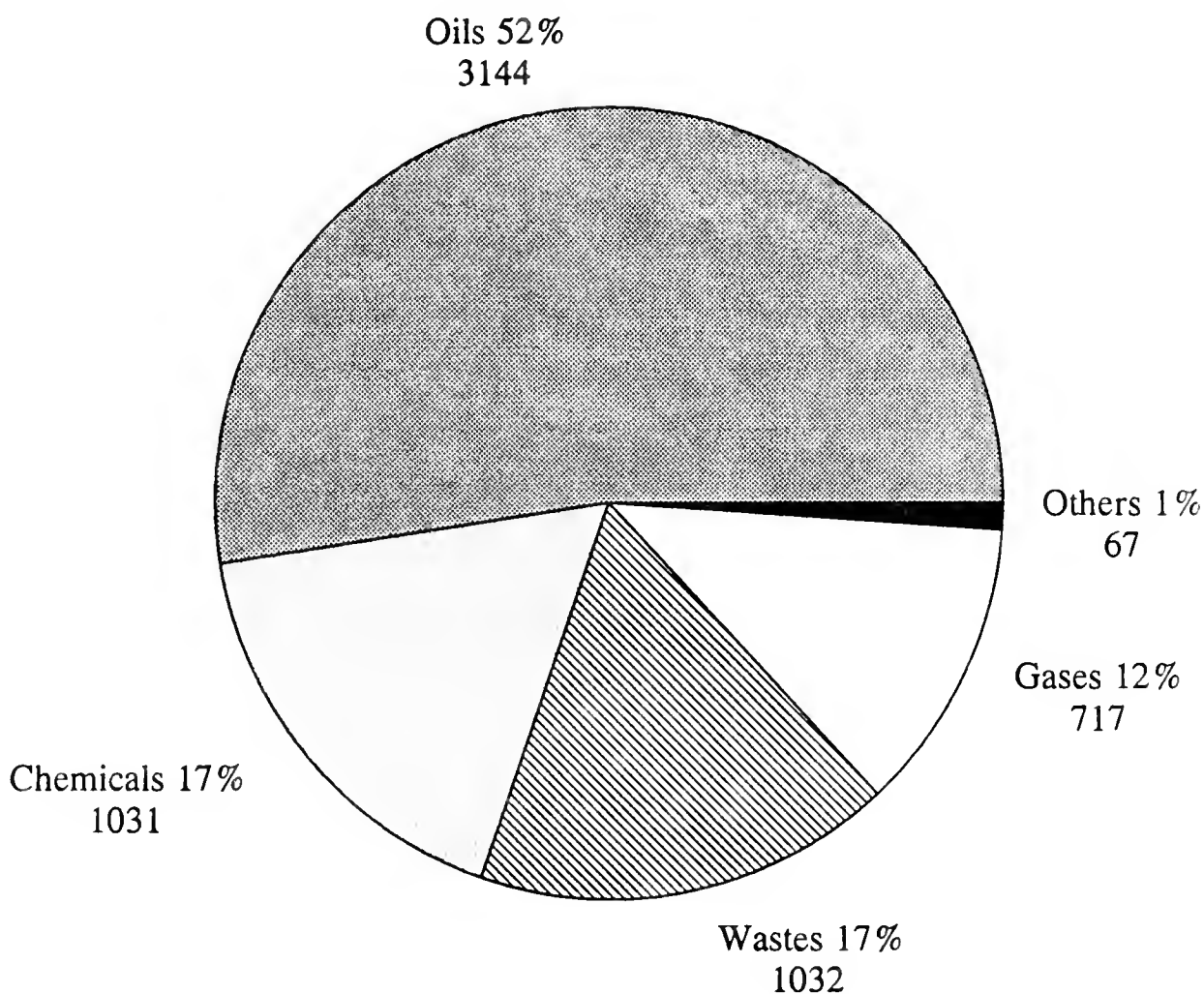
The second largest category of spilled materials is chemicals which include chemical solutions. These substances are often referred to as environmentally hazardous materials and comprise 17.2% of all materials spilled. As was the case in 1988 and 1989, the two largest chemical sub-categories are "other organic" and "other inorganic" which together account for just over half of all chemical spills and 8.9% of all materials spilled. Spills involving PCBs (Polychlorinated Biphenyls) in concentrations greater than 50 parts per million account for 11.0% of chemical spills and 1.9% of all spills reported to SAC in 1990 - down from 2.4% of all spills reported in 1989.

Figure 6 graphically illustrates the breakdown of spills by the major material categories i.e. oils, chemical or chemical solutions, wastes, gases and others.

TABLE 3
SPILLS BY MATERIAL AND REGION

MATERIAL GROUP		MOE REGION						TOTAL
		SW	WC	C	SE	NE	NW	
OILS	Crude	8	1	4	0	0	0	13
	Gasoline/Jet Fuel	105	94	270	113	62	38	682
	Light Petroleum Oils	300	329	673	380	225	117	2024
	Heavy Petroleum Oils	33	68	37	25	15	10	188
	Other Petroleum	48	50	52	27	21	9	207
	Non-Petroleum Oils	5	13	9	1	1	1	30
	SUB-TOTAL	499	555	1045	546	324	175	3144
CHEMICALS	Acids	13	30	33	52	9	3	140
	Bases	9	5	10	7	1	4	36
	Halogenated Solvents	7	2	16	3	1	0	29
	Non-Halogenated Solvents	34	26	39	7	4	2	112
	Pesticides	9	17	13	6	15	5	65
	PCB's	30	16	48	7	6	6	113
	Other Organic Chemicals	49	64	82	54	16	12	277
	Other Inorganic Chemicals	35	72	56	57	22	17	259
	SUB-TOTAL	186	232	297	193	74	49	1031
GASES	Smoke	20	140	35	10	13	0	218
	Dust/Particulate	14	70	16	15	7	1	123
	Nitrous Oxides	1	2	0	25	1	0	29
	Sulphurous Oxides	2	2	5	1	11	0	21
	Natural Gas (Methane)	4	5	9	8	3	0	29
	Other Gases	64	122	36	50	13	12	297
	SUB-TOTAL	105	341	101	109	48	13	717
WASTES	Liquid Industrial	28	137	28	14	121	21	349
	Hazardous Solid	1	3	2	3	4	1	14
	Non-Hazardous Solid	6	9	18	5	39	4	81
	Sewage	28	60	60	70	72	27	317
	Agricultural Wastes	23	10	1	1	1	0	36
	Other Wastes	33	69	49	25	49	10	235
	SUB-TOTAL	119	288	158	118	286	63	1032
OTHERS	Feed & Foodstuff	2	3	4	3	0	0	12
	Unknown	8	8	16	2	3	0	37
	Other Materials	1	1	4	2	10	0	18
	SUB-TOTAL	11	12	24	7	13	0	67
TOTALS		920	1428	1625	973	745	300	5991

Figure 6
Spills By Material Group



A three year comparison of spills by material types is provided in Table 4. The relative percentages of each major material category are shown along with the actual number of materials spilled. The results presented in Table 4 show that there have not been any significant changes in the relative percentages of the types of materials spilled for 1990. However, the percentages of oils and waste spills are slightly higher in 1990 while gaseous and chemical spill percentages are slightly down. These differences are, in part, attributed to improved distinctions between material categories as opposed to actual changes in materials spilled.

TABLE 4
THREE YEAR COMPARISON OF SPILLS BY MATERIAL

MATERIAL GROUP	YEAR					
	1990		1989		1988	
	SPILLS	%	SPILLS	%	SPILLS	%
Oils	3144	52.4	2831	49.8	2136	50.8
Chemicals	1031	17.3	1118	19.6	798	19.0
Gases	717	12.0	864	15.2	546	13.0
Wastes	1032	17.2	763	13.4	602	14.3
Unknown	37	0.6	81	1.4	96	2.3
Other	30	0.5	32	0.6	24	0.6
TOTALS	5991	100.0	5689	100.0	4202	100.0

QUANTITIES

Spill quantity information is presented by sorting liquid spills of the main material categories (oils, chemicals and wastes) according to the quantity groups, shown in Figure 7. Solid material spills have also been included by converting from kilograms to litres.

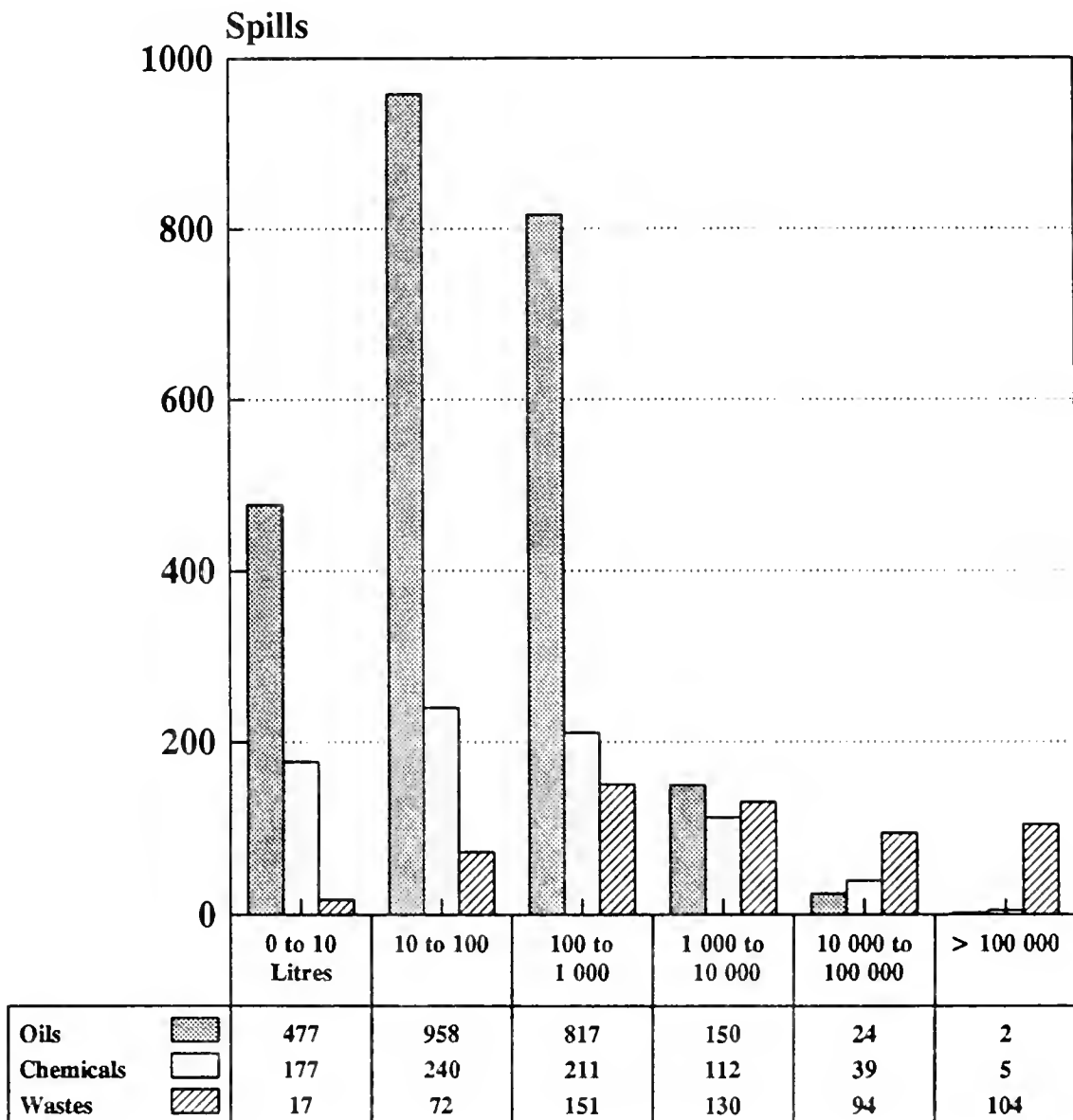
From Figure 7, it is clearly evident that a large proportion of spills reported to SAC involved oils and that many of these were relatively small quantities. The data points (i.e. the number of spills in each quantity group) at the base of the graph can be used to show that 477 oil spills (20% of the oil spills) were less than 10 litres, 1,435 (60%) were quantities less than 100 litres (roughly double the capacity of the fuel tank of an automobile) and 2,252 (93%) were less than 1000 litres (about the size of a home heating fuel oil tank). These figures were similar in previous years.

About 53% of the chemical spills were less than 100 litres. Chemical spill quantities are generally larger than oil spill quantities because they include spills of chemical solutions where the chemical of concern makes up only a portion of the reported spill quantity. This applies even more so to waste or wastewater spills which frequently consist of large quantities of water carrying low concentrations of chemicals and other contaminants. Only 16% of the waste spills were less than 100 litres.

Figure 8 summarizes gaseous spills. Duration was selected as the summary parameter since the volume discharged was unknown for a large portion of these. The graph illustrates that smoke accounts for a significant number of gaseous spills especially in the 5 to 30 minute duration range. All duration ranges include a large proportion of "other gases" which include a variety of other substances such as ammonia, hydrogen sulphide, vinyl chloride, coke oven gases, and numerous other gaseous mixtures. Generally, the duration of release is not a good indicator of the potential impact of a spill, i.e., a longer

release does not mean a more serious release. In fact, of the 486 air spills for which duration was known, 15 were found to have confirmed impact and 10 of the 15 involved durations of 30 minutes or less.

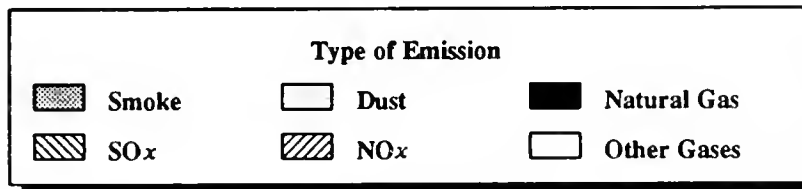
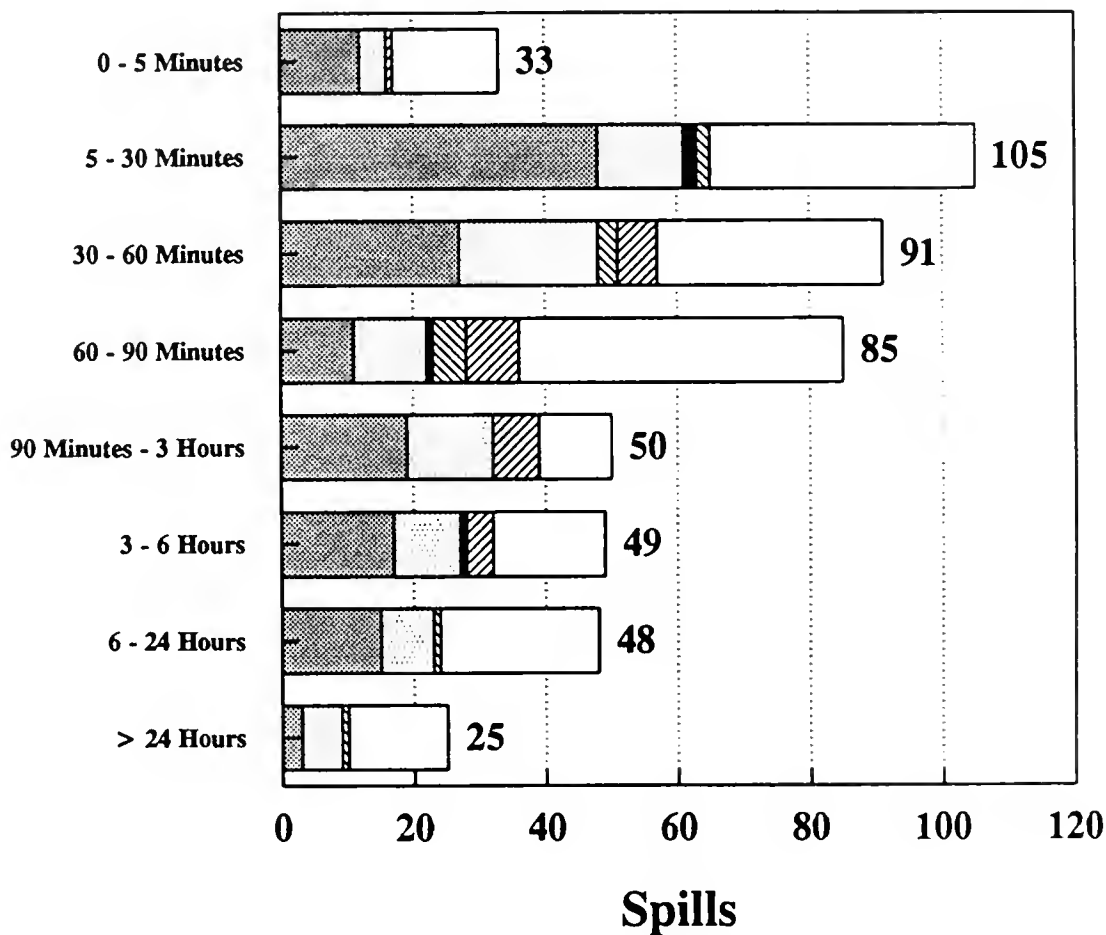
Figure 7
Spill Volumes
By Material Type



Volume was known for 73% (3780) of the
 Spills involving these material groups

Figure 8
Gaseous Spills
By Duration of Emission

Duration



Total Number of Gaseous Spills: 717
Duration was known for 486 (68%)

ENVIRONMENTAL IMPACT

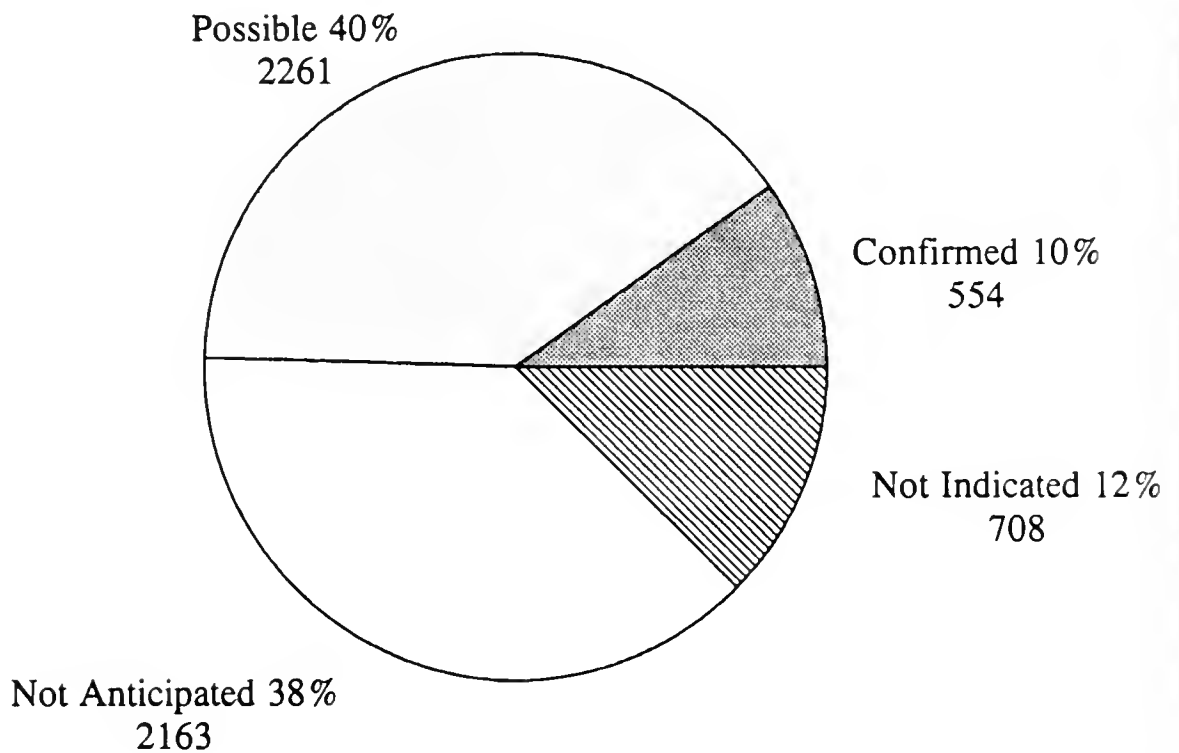
This report summarizes information on 5,686 reported spills. These spills involve a wide range of materials, quantities, and circumstances, all of which can contribute to the spill's effect on the environment. In order to provide some measure of the seriousness of a spill, the occurrence report form contains a field for documenting the likelihood of environmental impact, as well as a field which describes the nature of possible or confirmed impacts. The likelihood of impact and nature of "confirmed" impacts are summarized in Figures 9 and 10 respectively.

Adverse environmental impact was confirmed in 554 (just under 10%) of the 5,686 spills reported in 1990, as shown in Figure 9. A further 2,261 spills (40%) were recorded as having a potential impact or adverse effect. A similar number of spills (2,163 or 38%) were considered not to have any adverse environmental impact. Environmental impact information was not available for 708 or 12% of the total number of spills.

Figure 10 illustrates that for spills with a confirmed environmental impact, two-thirds involved soil contamination and one-fifth involved surface water contamination. The ten incidents which refer to impact on wild life consist of nine spills that resulted in confirmed fish kills and one that caused the deaths of some frogs.

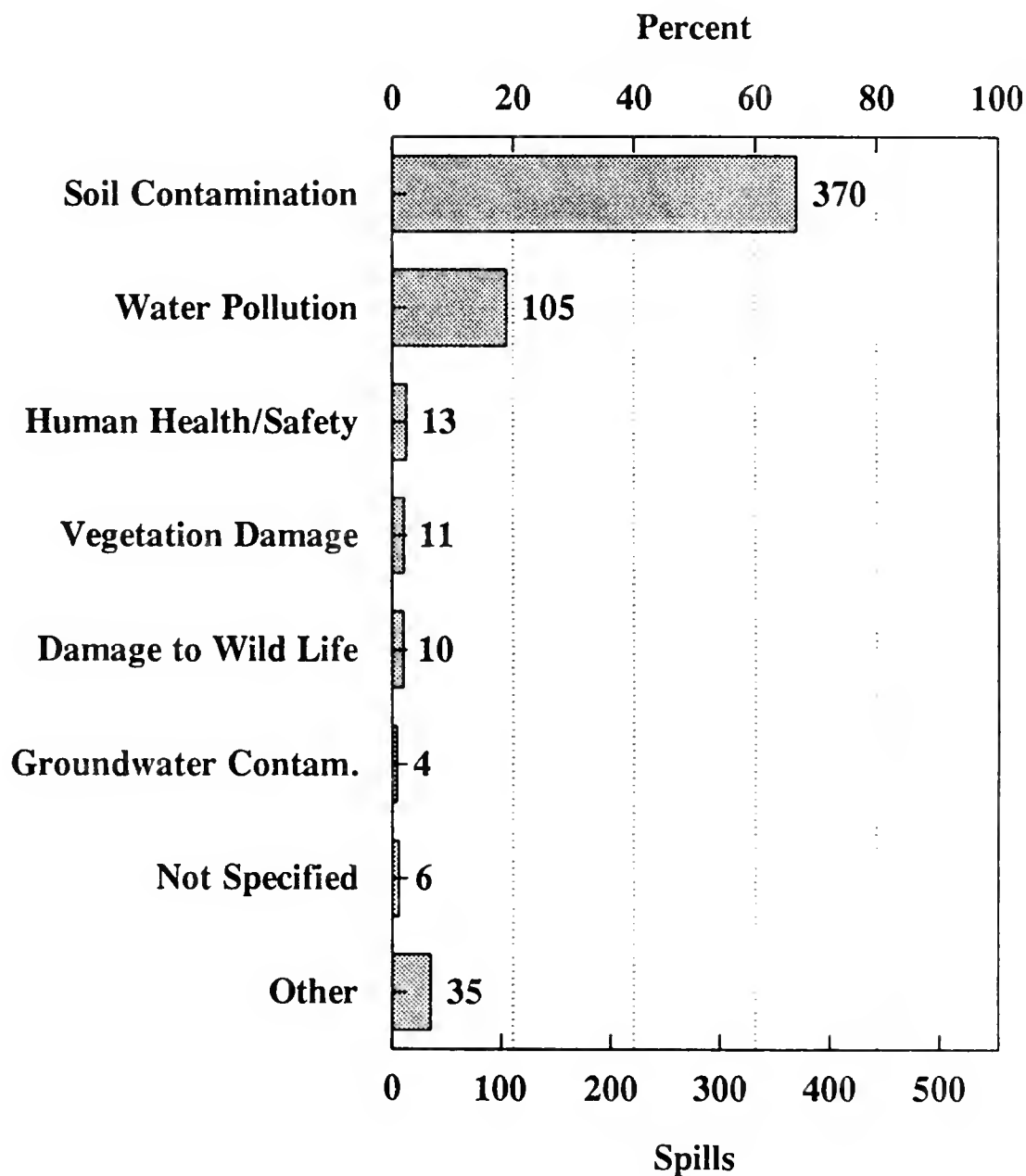
Thirteen spills resulted in human health and safety concerns. One incident involved a resident who died as a result of his misuse of an acid; four involved precautionary evacuations due to spills of gasoline, natural gas, ammonia and one unknown material; six spills were reported to have caused throat irritations; one spill caused a short-term exceedence of air quality standards in an urban area; and one spill involved a worker at a chemical plant who was exposed to a carbon tetrachloride release without injury.

Figure 9
Environmental Impact



Reported Spills: 5 686

Figure 10
Nature of Confirmed Impact



Total Spills Where Environmental
Impact Confirmed: 554
Total Spills: 5686

SPILL CLEANUP

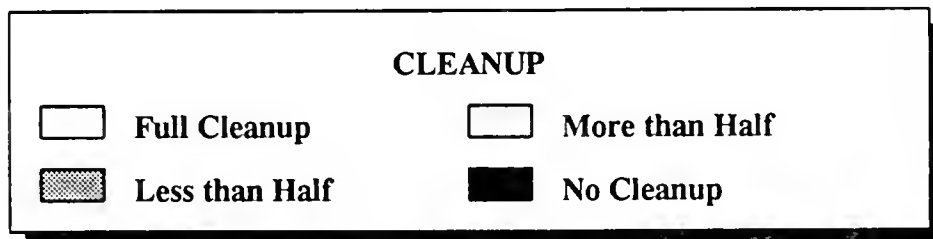
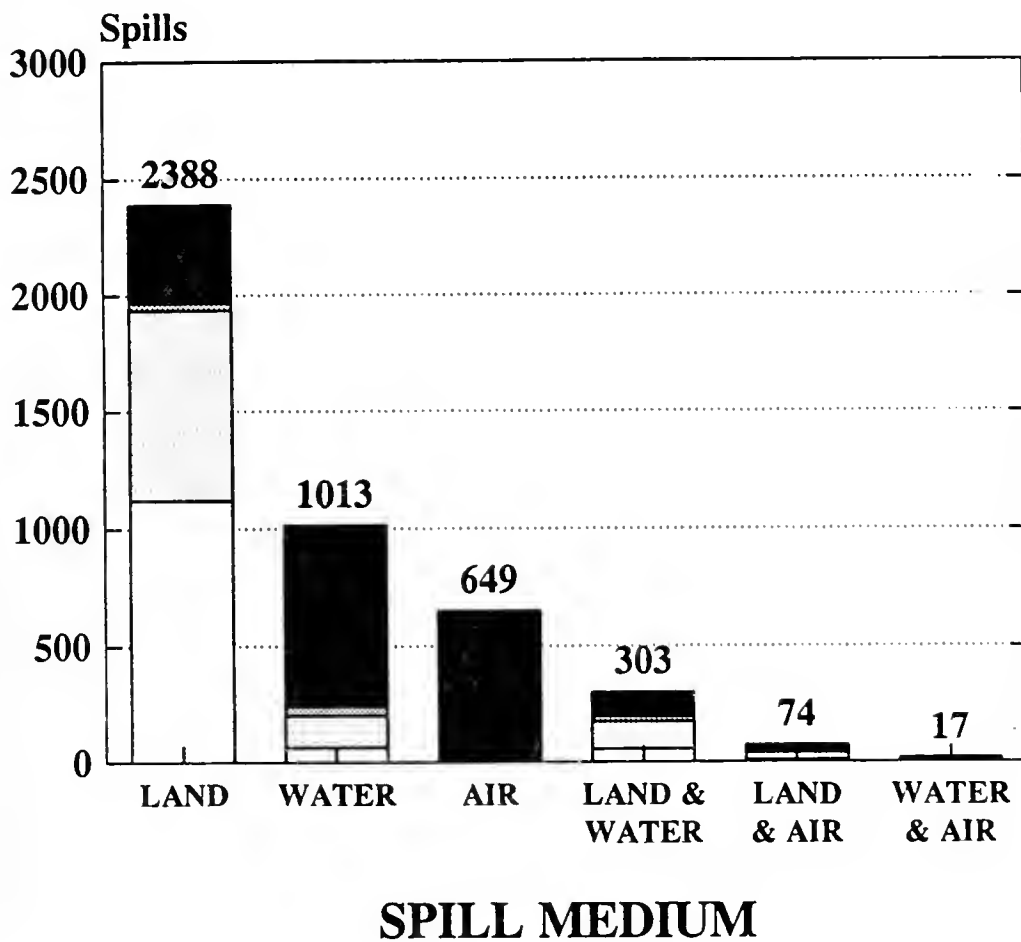
Part IX of the Environmental Protection Act requires that spills be cleaned up promptly and to the extent practicable. It places the primary cleanup responsibility on the discharger, that is the owner or person in control of a pollutant immediately prior to the spill. For the most part, spills are cleaned up directly by those responsible or indirectly by their contractors or industrial spill cleanup cooperatives. Public sector agencies provide a cleanup response on an as required basis.

The success of cleanup efforts is often related to the terrain and access to the spill site, soil conditions, types of water bodies involved, the quantity and nature of the material(s), weather and light conditions, availability of expertise and resources, and the time required to mobilize a response. Generally, spills to land have a much higher cleanup success rate than do spills to surface waters. Releases of gaseous substances to atmosphere are normally impossible to clean up.

Figure 11 shows the comparative cleanup success rates for spills to land, water, air, and combinations of these. It shows that about half of the spills to land were entirely cleaned up and about 80% were more than half cleaned up. By comparison only about 20% of the water spills were either cleaned up completely or partially, which is fairly consistent with globally reported success rates for cleaning up spills to water.

The cleanup success rates for the multiple medium spills shown in Figure 11 generally reflect the proportion of the spill which was to land. For example if a liquid is spilled to land and a portion of the spill escapes to a watercourse the spill is classified as a spill to land and water. Generally, that portion which was contained to land can be cleaned up while the portion that went to water can not be cleaned up.

Figure 11
Spill Cleanup by Medium



Cleanup information available for
4444 Spills (78% of total)

SECTOR GROUPS AND SOURCES OF SPILLS

Figure 12, shown on the following page, summarizes spills by the various industrial and service sectors. The four industrial sectors with the largest numbers of reported spills were transportation, petroleum, chemical, and metallurgical. Collectively, they accounted for almost half of the spills reported to SAC. Table 5 compares the 1990 results for these four sectors to the previous two years' results.

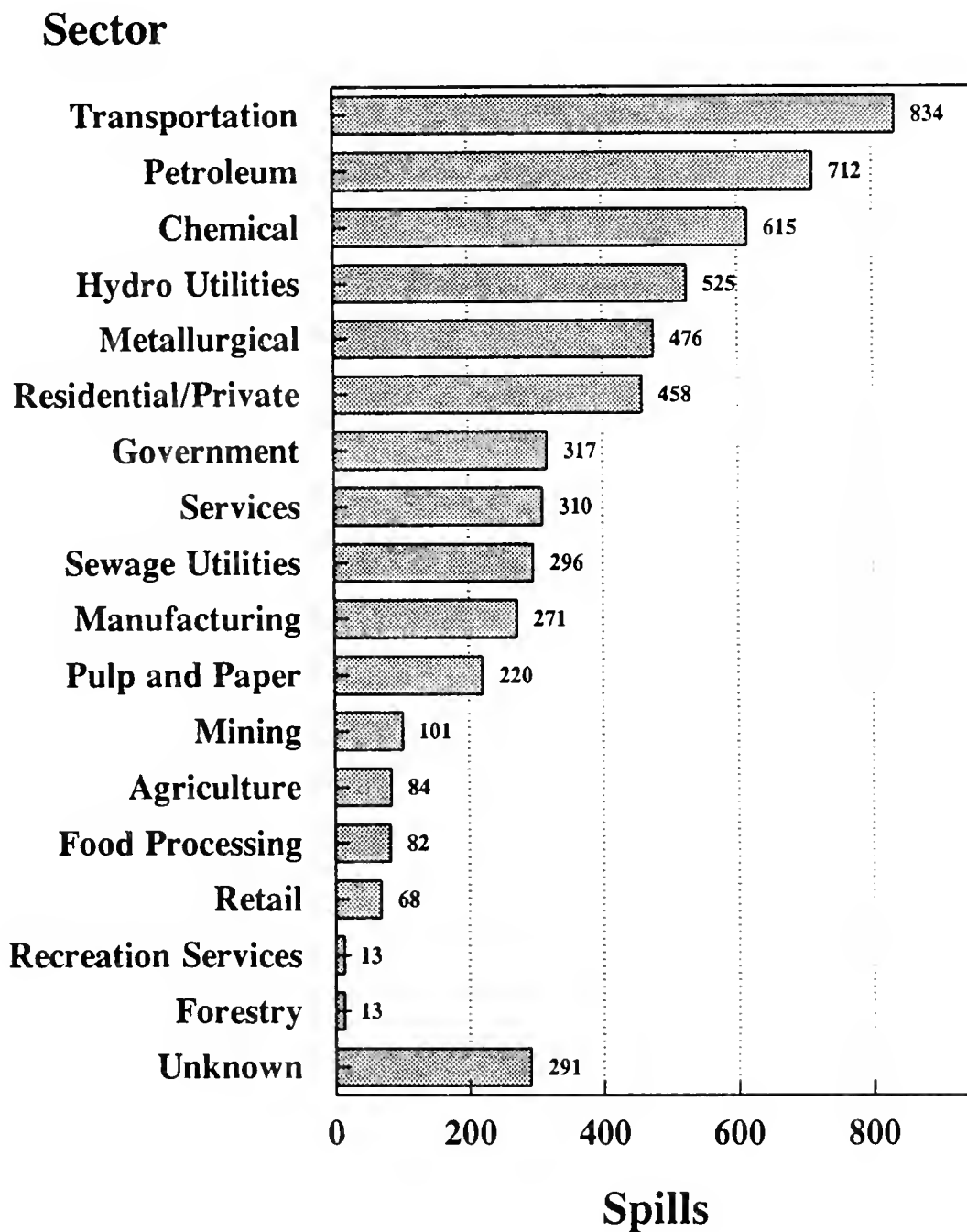
TABLE 5**YEARLY COMPARISON OF HIGHEST RANKED INDUSTRIAL SECTORS**

INDUSTRIAL SECTORS	YEAR					
	1990		1989		1988	
	SPILLS	%	SPILLS	%	SPILLS	%
Transportation*	834	14.7	715	13.4	473	11.6
Petroleum	712	12.5	709	13.3	547	13.4
Chemical	615	10.8	585	10.9	416	10.2
Metallurgical	476	8.4	502	9.4	424	10.4
TOTALS	2 637	46.4	2 511	47.0	1 860	45.6

*The transportation sector represents companies and carriers whose only business is providing transportation services, i.e. commercial carriers who transport materials for their customers. The 834 transportation sector spills shown for 1990 represent only a portion of all transportation related spills.

Figure 12

Spills By Sector



Reported Spills: 5686

In addition to the four industrial sectors already discussed, Figure 12 shows significant numbers of spills from other sector categories including hydro utilities, the residential or private sector, the government sector, as well as spills from sewage utilities.

The 525 hydro utility spills involve discharges of insulating oils from capacitors or transformers in Ontario's vast electrical distribution system. Some are the direct result of traffic accidents or electrical storms in which ground level or pole mounted transformers are ruptured. Ontario Hydro and local municipal utilities are responsible for maintaining their respective portions of Ontario's electrical network and for cleaning up these spills when they occur. The hydro utility category also includes spills from Ontario power generating plants. Generally, these spills involved hydraulic fluids, lubricating oils or abnormal discharges of smoke.

The 458 spills categorized as being from the residential or private sector spills primarily involved discharges of operating fluids from privately owned motor vehicles and discharges from home heating fuel tanks.

The government sector category shown in Figure 12 includes all three levels of government, that is, municipal, provincial and federal. The 317 spills attributed to this category include discharges from government vehicles and storage tanks. There were also 296 spills from provincial and municipal sewage utilities. These involved abnormal or accidental discharges of sewage from about 420 sewage treatment plants and numerous pumping stations across the Province. About 60% of the plants are run by the Province while the remainder are operated by the municipalities they serve.

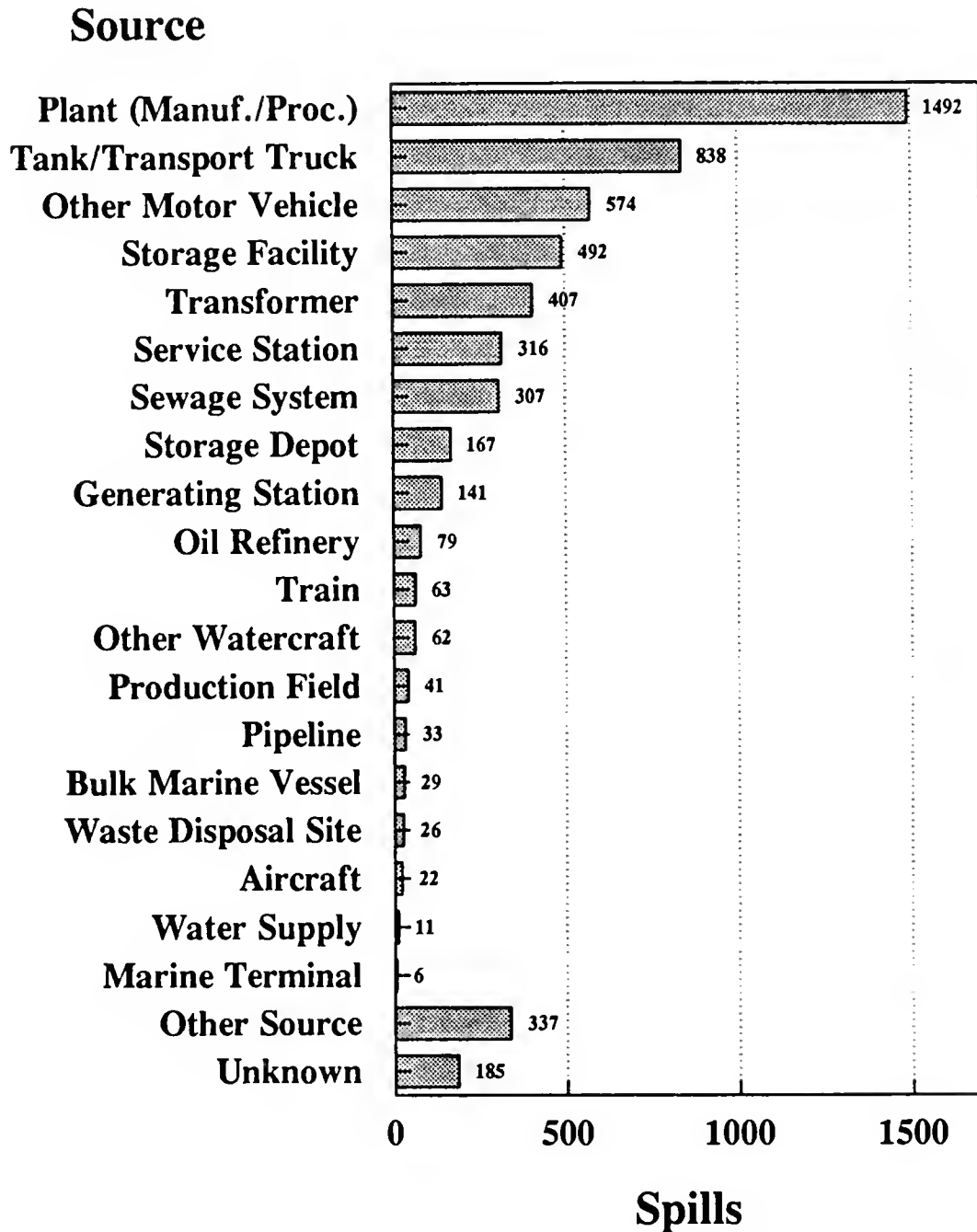
Figure 13 summarizes spills by 21 specified source categories. Some of the source coding categories, which are described in Appendix II, had to be grouped to permit the results to be presented graphically. All of the transportation source spills combined (i.e. non-fixed facility spills) accounted for 1,588 reported spills which is almost double the number of spills attributed to the transportation sector (834) in Table 5. The additional transportation related spills were from other sectors such as the petroleum, chemical and public sectors which engage in their own transportation activities. They also included operating fuel spills from private motor vehicles. The plant source category which includes a range of manufacturing and processing fixed facilities accounted for 1,492 spills (26.2% of all spills). By combining the source and sector data provided in Appendix VI these plants can be broken down as shown in Table 6.

TABLE 6
MANUFACTURING AND PROCESSING PLANT SUMMARY

MANUFACTURING/PROCESSING FACILITY SECTOR	NUMBER OF SPILLS	% OF ALL SPILLS
Chemical Plants	543	9.5
Metal & Steel Plants	442	7.8
Pulp and Paper Plants	211	3.7
General Manufacturing Plants	208	3.7
Food Processing Plants	56	1.0
Mining Processing Plant	18	0.3
Petroleum Facilities*	7	0.1
Other Sectors	7	0.1
TOTALS	1492	26.2

* does not include 79 Petroleum Refinery Spills

Figure 13
Spills By Source



Total Spills: 5686

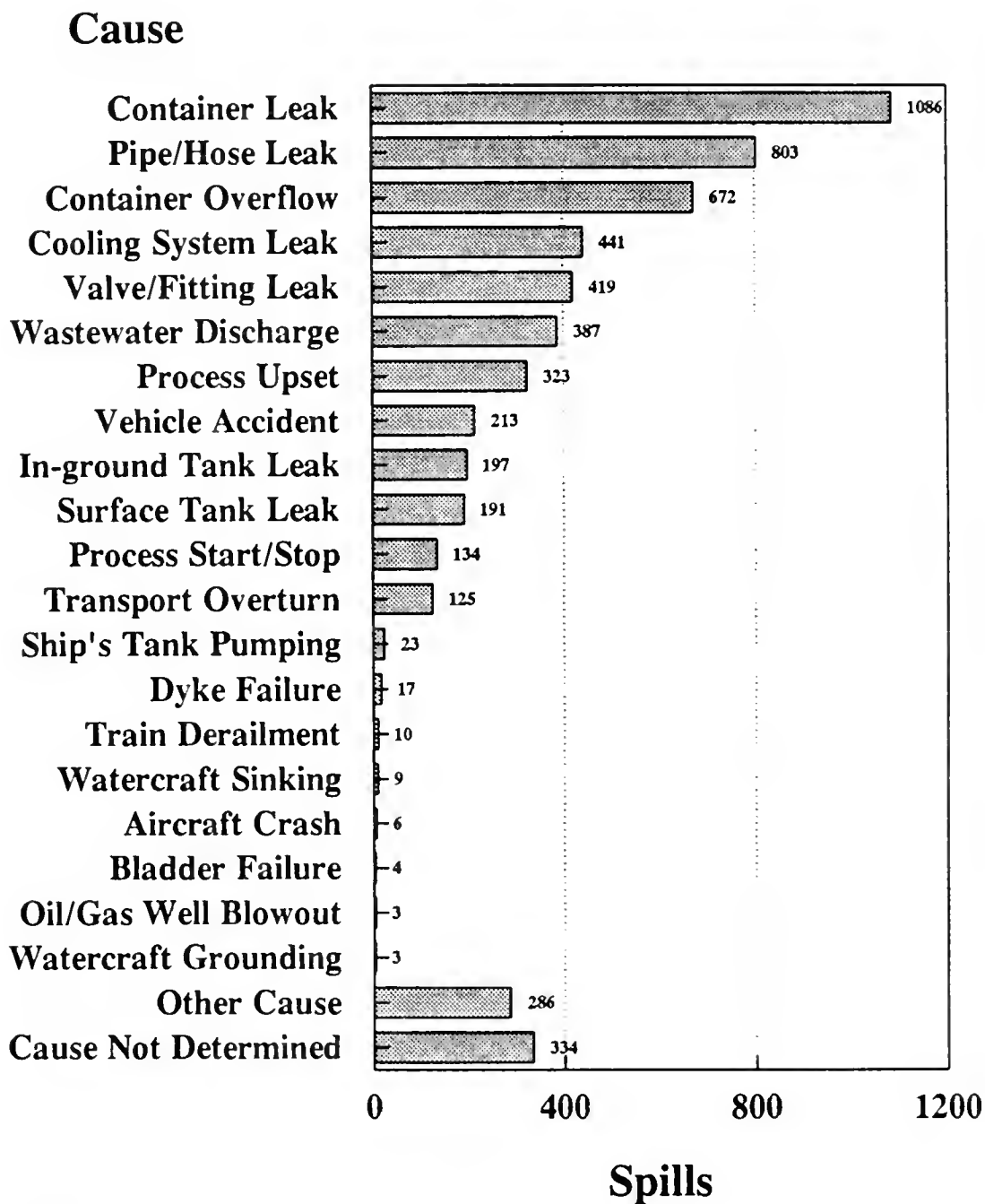
CAUSE AND REASON

Figures 14 and 15 summarize the various causes and reasons attributed to spills reported to SAC during 1990. "Cause" refers to how a spill occurred and "reason" attempts to clarify the cause by identifying the primary contributing factor. For example, a spill may be caused by a transportation accident and the reason for the accident may be adverse road conditions.

Figure 14 shows that container leaks, pipe and hose leaks and container overflows caused nearly half of all spills, while Figure 15 shows that equipment failure and operator error were the major reasons for spills. These values are consistent with those presented in previous years.

The various combinations of causes and reasons for spills are presented in Appendix VII. This appendix can be used in conjunction with the code descriptions provided to obtain additional information or to identify significant trends in the causes and reasons for spills. For example, to determine the number of spills involving tank or lagoon overflows resulting from operator error look up cause code 09 (overflows - tanks, lagoons) and reason code 02 (error) in Appendix IV. It can be seen that there were 334 spills that meet these two parameters. In a similar manner Appendix VII can be used to show that there were 169 tank or lagoon overflows resulting from equipment failure (reason code 10) and 46 resulting from process upsets (reason code 17).

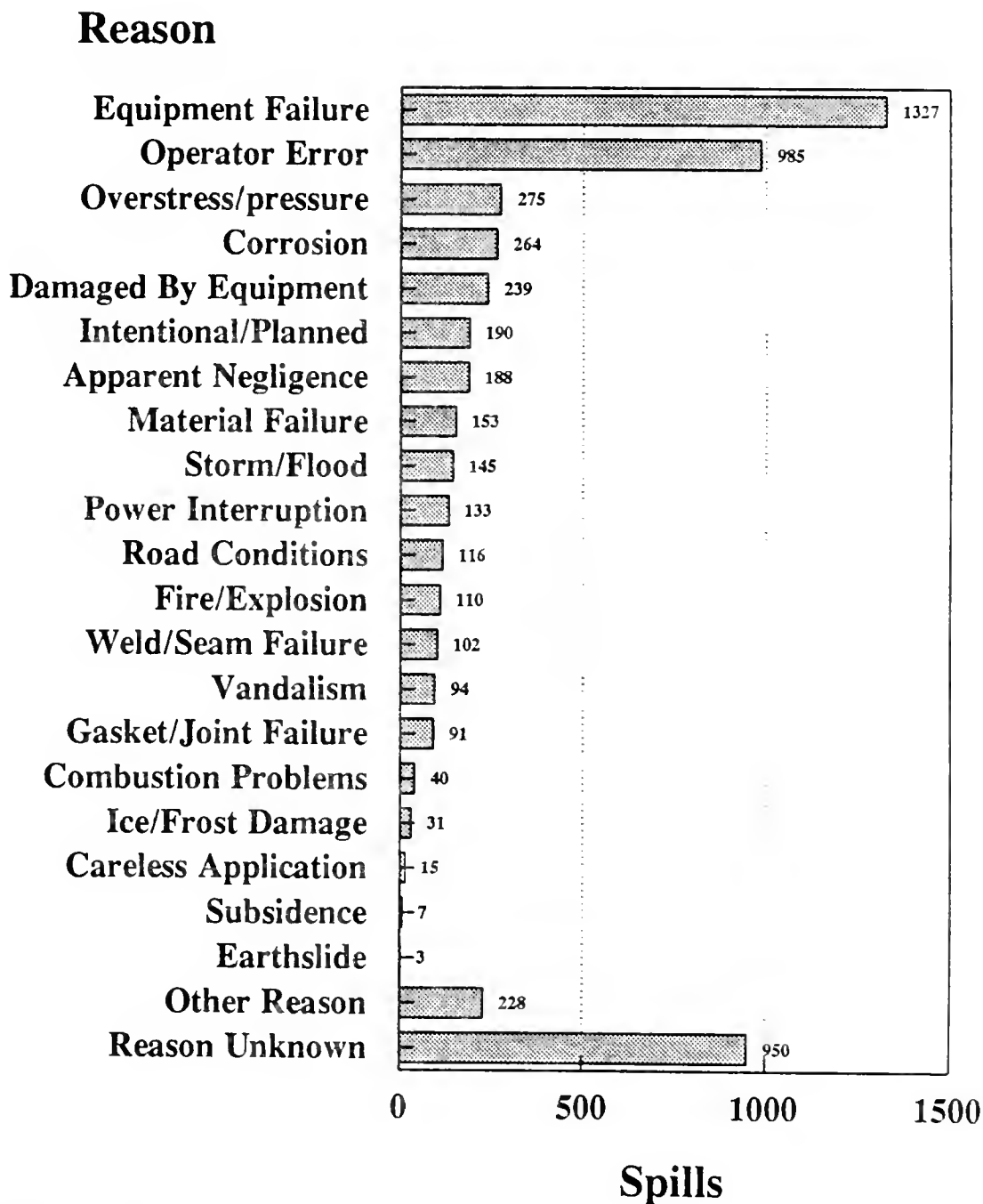
Figure 14
Spills By Cause



Reported Spills: 5686

Figure 15

Spills By Reason



Reported Spills: 5686

PART III
SPILLS TO THE GREAT LAKES AND THEIR
INTER-CONNECTING CHANNELS

This section of the report focuses on oil and chemical spills to the Great Lakes System. The importance of the Great Lakes cannot be overstated. They contain about 20% of all of the world's fresh water and serve an estimated 25 million people, along with an abundance of wild life. While it is presumed that spills constitute a very small fraction of total pollution loadings to the Great Lakes, the immediate impact of some spills can be significant near the source.

Oil and chemical spills which occurred during 1990 were analyzed closely to identify those which were spilled to the Great Lakes and the Interconnecting Channels. Spills from shore facilities, spills associated with the marine transportation mode which occurred on or to the waters of the Great Lakes System, and spills to sewers or drains which discharge directly to the waterbodies were included in this group. A summary of these spills is presented in Table 7 listing the total number of times oils and chemical materials were spilled to the various waterbodies of the Great Lakes. This table identifies 340 materials spilled to the Great Lakes.

Table 8 identifies the main industry and private sector groupings which contributed to the 333 spill incidents recorded. These incidents resulted in the 340 materials spilled that were identified in Table 8. Seven incidents involved two materials spilled at the same time, one incident each to Lakes Superior, Huron, Erie, Ontario, and St. Marys River, and two incidents in the St. Clair River. This accounts for the apparent discrepancy of the totals between Tables 7 and 8.

TABLE 7

OIL AND CHEMICAL SPILLS TO THE GREAT LAKES - MATERIAL SUMMARY

MATERIAL GROUP	WATERBODY										TOTAL
	LAKE SUPERIOR	ST. MARYS RIVER	GEORGIAN BAY	LAKE HURON	ST. CLAIR RIVER	DETROIT RIVER	LAKE ERIE	NIAGARA RIVER	LAKE ONTARIO	ST. LAURENCE RIVER	
OILS	Gasoline/Jet Fuel	1	1	2	2	2	1		6	3	19
	Light Petroleum Oils	5	2	8	12	4	8	2	26		68
	Heavy Petroleum Oils	1	1		12	1	9	2	14		40
	Other Petroleum Oils	1	3	2	9	6	7		29	4	61
	Non-Petroleum Oils	1			2				2		5
	SUB-TOTAL	9	7	12	37	13	25	4	77	7	193
CHEMICALS	Acids	1		1	1	1	1		5	38	48
	Bases	2			3				2	4	11
	Halogenated Solvents				4						4
	Non-Halogenated Solvents				13				6		19
	Other Organic		1		10				7	3	21
	Other Inorganic	3	2		7		1	1	15	15	44
	SUB-TOTAL	6	2	1	38	1	2	1	35	60	147
	TOTAL	15	9	13	75	14	27	5	112	67	340

TABLE 8

OIL AND CHEMICAL SPILLS TO THE GREAT LAKES - SECTOR SUMMARY

SECTOR	WATERBODY										TOTAL
	LAKE SUPERIOR	ST. MARYS RIVER	GEORGIAN BAY	LAKE HURON	ST. CLAIR RIVER	DETROIT RIVER	LAKE ERIE	NIAGARA RIVER	LAKE ONTARIO	ST. LAURENCE RIVER	
Chemical					32	1		2	2	58	95
Food Processing									1		1
Municipal Government							1		1		2
Provincial Government	1			2	8		10	2	9		32
General Manufacturing					1			1	3	1	6
Metallurgy		1				2			44		47
Mining				1							1
Petroleum				1	7		2		7		17
Pulp & Paper	8	1			1					1	11
Residential/Private	1		3	4	1	1	2		5	2	19
Retail		1				1				1	3
Service Industry		1		1	2	2			2	1	9
Transportation	3			3	20	3	8		17	1	55
Unknown	1	4			1	4	3		20	2	35
TOTAL	14	8	3	12	73	14	26	5	111	67	333

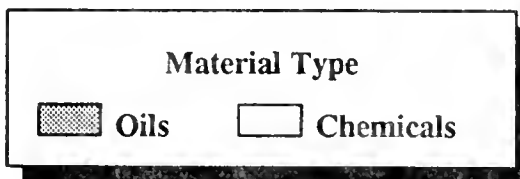
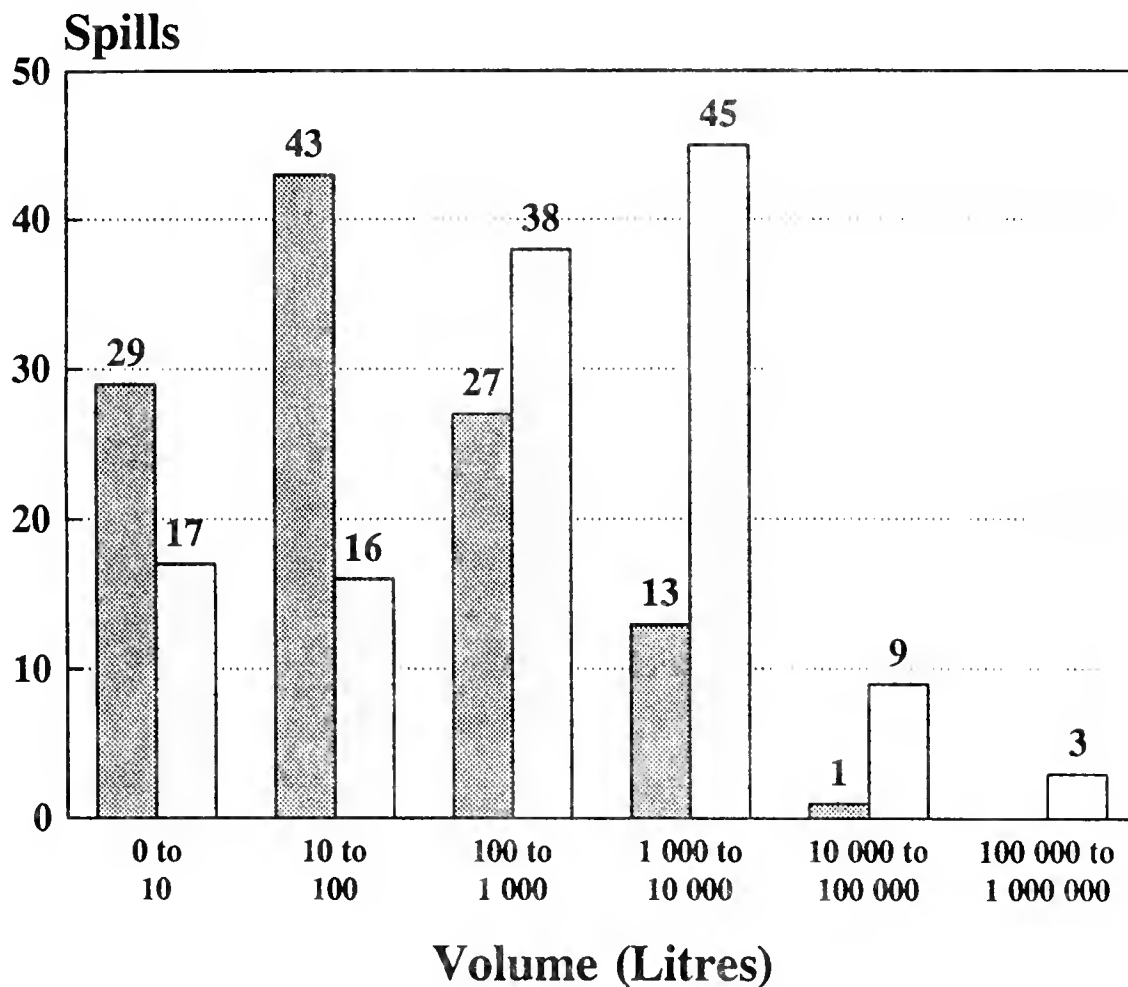
Figure 16 reflects the number of oil and chemical spills to the Great Lakes respectively in volume groups similar to those presented in Part II of the report. About 90% of these spills were in quantities of less than 1000 litres each. This is a further indication that, for the majority of spills reported, each involves relatively small quantities.

As indicated in Part II of this report, oil spills are more difficult to deal with when they occur in open waterbodies. Currents encountered in the interconnecting channels of the Great Lakes make cleanup even more difficult. Spills of chemicals add another level of difficulty to cleanup efforts, and spills of soluble chemicals, chemical suspensions, or solutions are essentially impossible to clean up. These generalities are supported by Table 10 which summarizes information on cleanup achieved for oil and chemical spills to the Great Lakes for which clean up information was available. Cleanup details were not known for 81 of the 340 materials spilled to the Great Lakes System.

TABLE 9
GREAT LAKES SPILL CLEANUP

CLEANUP	OILS	CHEMICALS
no cleanup achieved or possible	78	102
less than half of spilled material cleaned up	14	2
more than half cleaned up	42	4
full cleanup	14	3
TOTAL	148	111

Figure 16
**Great Lakes Spill Volumes
By Material Type**



Volume was known for 259 of 340 (76%)
Spills involving Oils and Chemicals

APPENDIX I

SAMPLE OCCURRENCE REPORT

OCCURRENCE REPORT

Received By JOHN RITCHIE	Region No. 9002020346-	S.A.C. No. 9003726-	I.E.B. No.
Occurrence Type: SPILL Subtype: LAND Action Class: 1:[25] 2:[12] 3:[]	Occurrence: 90/04/12	Date 90/04/12	Time (24 hr) 02:30
Reported by (Name/Organization) PAUL WILSON WATERLOO R.M. Tel. No.: 519-650-8267 EXT.: Alt. No.: - - EXT.: Address:	Report to SAC: 90/04/12 Report to MOE: 90/04/12 MOE at Scene: 90/04/12	04:39 04:39 15:30	Environmental Officer Assigned: BRYAN RAYNER

Postal Code:

Location of Occurrence: Region.: 2 WEST CENTRAL District: CA CAMBRIDGE Municipality: 25101 CAMBRIDGE CITY PINEBUSH RD	Source: PRIVATE OWNER MOTOR VEHICLE Source: [MV] Sector: [RS] SIC: [9741] UTM: N: [] E: [] Zone: [17]
--	--

Brief Summary:

VEHICLE COLLIDED WITH SIGNPOST, PUNCTURING FUEL TANK. FUEL SPILLED ALONG 3 KM STRETCH OF PINEBUSH RD (WEST FROM WELLINGTON CTY RD #32).
OPP, REGION ON SCENE. REGION APPLIED SAND, WILL RECOVER MATERIAL LATER TODAY. SOME PARTS OF GRAVEL ROAD MAY HAVE TO BE EXCAVATED.
ABATEMENT REPORT INDICATED THAT THE CITY OF CAMBRIDGE RECOVERED THE SAND AND DUG UP ANY CONTAMINATED SOIL FROM DITCH AND DISPOSED OF THE MATERIAL AT THE CAMBRIDGE LANDFILL. SITE WAS INSPECTED BY BRYAN THE NEXT DAY AND CLEAN-UP WAS SATISFACTORY.

If there are related reports, list them in the summary preceeded by 'RELATED'.

Follow-up Action: [Y] Abatement [N] IEB
SITE VISIT - CLEAN-UP COMPLETE.

Suspected Violation Code: []

No Further Action By: [Y] Abatement [Y] File Closed [] IEB Investigator Assigned
[Y] IEB

Report Prepared by: BRYAN RAYNER	Date 90/11/09	BF Date	Person-Days	MBR	Function
-------------------------------------	------------------	---------	-------------	-----	----------

District Officer JOHN COOKE	Date 90/11/09	Reviewing Officer	Date
--------------------------------	------------------	-------------------	------

List numbers showing: A - routing of the original, B - distribution of copies.

A: [] [] [] [] [] [] []	1. Investigator/ERP	4. Reg.Dir or Mgr
B: [] [] [] [] [] [] []	2. Distr.officer/file	5. IEB Reg. Super.
	3. SAC	6. IEB H.O./file

Region No.: 9002020346- S.A.C. No.: 9003726- IEB No.:

Material 1: DIESEL FUEL Code...: 13
Amount: 180 L UN No.: 1202
Material 2: Code...:
Amount: UN No.:
Material 3: Code...:
Amount: UN No.:

Cause.....: OTHER TRANSPORTATION ACCIDENT Code...: 08
Reason.....: ERROR Code...: 02

Contact: [N] ERP Name: Date:
Callout: [] SAC Operator: Time: :

Controller of Material: Code...:
Owner of Material.....: Code...:
Agencies Involved.....: OPP, REGION, CAMBRIDGE WORKS DEPT

Clean up and Restoration Carried out by:
[N] Controller [N] Owner [Y] Other: CAMBRIDGE WORKS DEPT.

% Cleaned up: 100.00 Estimated Cost: \$
Were Directions or Approval Given Under | Emergency
EPA Part IX [N] Regulation 11/82 [N] | Generator No.

Waste Class: NOT APPLICABLE Code...: 000
Hauler: CITY OF CAMBRIDGE Code...:
Disposal Site: CAMBRIDGE WASTE DISPOSAL SITE Code...: A140104

Environmental Impact: | Nature of Impact:
CONFIRMED | Soil contamination Code...: 07

People/Business Damaged
(Other than to Owner/Controller)
CITY OF CAMBRIDGE
Nature of Damage: Cleanup/RESTORATION costs Code...: 03

APPENDIX II

ORIS CODING CATEGORIES

OCCURRENCE TYPE CODES

S Spill

sub category: **L** Land
 W Water
 A Air

N Notification

sub category: **01** Condition of Operation
 02 C of A Non-Compliance
 03 Order Non-Compliance

C Complaint

sub category: **01** Odour **06** Water Pollution
 02 Noise **07** Drinking Water
 03 Dust/Particulate **08** Vegetation Damage
 04 Smoke **99** Other
 05 Litter/Waste

O Other

MATERIAL CODES

10 Series: OIL

- 11 Crude
- 12 Gasoline/Jet Fuel/Kerosene
- 13 Light Petroleum Oils: Motor,
Diesel, Furnace, Mineral
- 14 Heavy Petroleum Oils: Bunker,
Lubricating, Tar, Asphalt
- 15 Other Petroleum Oils
- 16 Non-Petroleum Oils

20 Series: CHEMICAL

- 21 Acids
- 22 Bases
- 23 Halogenated Solvents
- 24 Non-Halogenated Solvents
- 25 Pesticides
- 26 Polychlorinated Biphenyls
(PCB's)
- 27 Other Organic
- 28 Other Inorganic

30 Series: GASES/PARTICULATE

- 31 Smoke
- 32 Dust/Particulate
- 33 Nitrous Oxides (NO_x)
- 34 SO₂
- 35 Natural
- 36 Other Gases

40 Series: WASTES

- 41 Liquid Industrial
- 42 Hazardous
- 43 Non-hazardous Solid
- 44 Sewage
- 45 Agricultural
- 46 Other Wastes

90 Series: MISCELLANEOUS

- 96 Feed & Foodstuff
- 97 Not Applicable
- 98 Unknown
- 99 Other

ENVIRONMENTAL IMPACT - NATURE OF IMPACT CODES

01	Human Health or Safety	06	Surface Water Pollution
02	Fish Kill	07	Soil Contamination
03	Other Kill or Injury	99	Other Damage
04	Vegetation Damage		
05	Groundwater Pollution		

Nature of Damage Codes

(Used to flag incidents of potential interest to
the Environmental Compensation Corporation)

01	Personal Injury	04	Business/Wages Loss
02	Property Damage		
03	Cleanup/Restore Cost	99	Other Damage

SECTOR CODE DESCRIPTION

AG	Agriculture	- includes co-ops, farms, ranches
CH	Chemical	- chemical processing facilities that produce basic chemicals or feed stocks (incl. derivative products) and associated bulk transport vehicles
FD	Food Processing	- canners, meat/fish packers (NOT distribution/retail)
FO	Forestry	- forestry activities, operations vehicles
Government	- GM (Municipal) - GF (Provincial) - GF (Federal)	- governmental and quasi-governmental bodies/organizations
GN	General Manufacturing	- light manufacturing; metal plating, fabricating, textiles, etc.
ME	Metallurgy	- steel and other metal manufacturing
MN	Mining	- mining operations and associated equipment/vehicles
PE	Petroleum	- includes bulk transport vehicles and service stations
PP	Pulp & Paper	- processing facilities of pulp and paper industry
RE	Recreation	- facilities which provide relaxation
RS	Residential/Private	- house, cottages, vehicles, boats, aircraft
RT	Retail	- diversified retail establishments
SI	Service Industry	- dry cleaners, waste disposal, contractors, hotels, etc. including libraries and educational institutions.
TA	Transportation	- carriers whose ONLY business is providing transportation services
OT	Other	- sector not otherwise defined
UK	Unknown	- sector not determined

SOURCE CODE DESCRIPTION

AC	Aircraft	- all vehicles that fly (except hovercraft)
BC	Bulk Marine Carrier	- carriers of solid bulk cargo
MT	Marine Tanker	- carriers of liquid/gaseous cargo
MR	Marine Terminal	- commercial waterfront facility
PC	Pleasure Craft	- privately owned recreational watercraft
OW	Other Watercraft	- other commercial or gov't watercraft
TR	Train/Railroad	- all vehicles that run exclusively on rails
TT	Tank Truck	- road vehicles carrying bulk cargo in liquid, gaseous, powdered or other pumpable forms
TP	Transport Truck	- general cargo transport road vehicle
MV	Motor Vehicle	- road vehicle not otherwise defined
PF	Production Field	- spills of raw materials at point of extraction
PL	Pipeline	- bulk transportation lines (excluding "in-plant" piping)
RF	Petroleum Refinery	- petroleum refining facilities
SD	Storage Depot	- bulk storage facilities from which materials are distributed for sale
SS	Service Station	- incl. airports, marinas and motor vehicle facilities
OS	Other Storage Facility	- storage for on-site/private use (industrial plants, farms, residences)
HP	Heat/Power Plant	- includes electric generating stations
OP	(Other) Plant	- manufacturing/processing facilities (except refineries)
ST	Sewage Treatment	- includes sewage treatment plants and lagoons
SW	Sewer	- municipal/industrial wastewater collection systems
TF	Transformer	- electrical transformers, capacitors etc.
WD	Waste Disposal	- landfill sites, industrial waste treatment plant
WS	Water Supply	- water treatment/distribution systems
OT	Other	- source not otherwise defined
UK	Unknown	- source not determined

CAUSE CODES

(answers the question, "what happened?")

- | | |
|--|---|
| 01 Collision (Watercraft) | - accidents involving watercraft only |
| 02 Grounding (Watercraft) | - watercraft running aground |
| 03 Sinking Watercraft | - other than from collision or grounding |
| 04 Ship's Tank/Bilge Pumping | - wastewater discharge from watercraft |
| 05 Derailment | - accidents where railcars or engines leave the rails |
| 06 Crash (Aircraft) | - applies only to aircraft accidents |
| 07 Overturn (Truck/Trailer) | - trucks and tractor trailers only |
| 08 Other Transport Accident | - road vehicle accidents other than above |
| 09 Overflow (Tanks, Lagoons) | - overfilling tanks, containers and dikes |
| 10 Pipe and Hose Leak | - from piping systems but not cooling systems |
| 11 Valve/Fitting Leak/Failure | - leaks from specific parts of equipment containers or pipelines |
| 12 Bladder Leak | - leaks from flexible storage containers |
| 13 Tank Leak (Underground) | - buried storage tanks and associated piping |
| 14 Container Leak, Fuel Tanks, Barrels | - includes bottles, boxes, vats & vehicle fuel/cargo tanks (other than cause 13 and 20) |
| 15 Discharge/Bypass to Watercourse | - accidental or unusual variation of wastewater discharges to watercourses |
| 16 Well Blowout (Oil and Gas) | - applies to oil or gas wells |
| 17 Process Upset | - an usual variation in the regular discharge of a contaminant to air due to a fluctuation in the process |
| 18 Dyke failure (Lagoons, Ponds) | - storage pond, lagoon wall failure |
| 19 Cooling System Leak | - applies to transformers, capacitors, vehicle radiators, nuclear reactors, or other power plants |
| 20 Tank Leak (Surface) | - storage tanks (fixed), tank-farm, heating systems (incl. delivery to disconnected filler-pipes) |
| 21 Start Ups/Shutdowns/Interruptions | - operating condition change |
| 98 Unknown | - cause of release not determined |
| 99 Other Discharges | - to air/land/water, not otherwise defined |

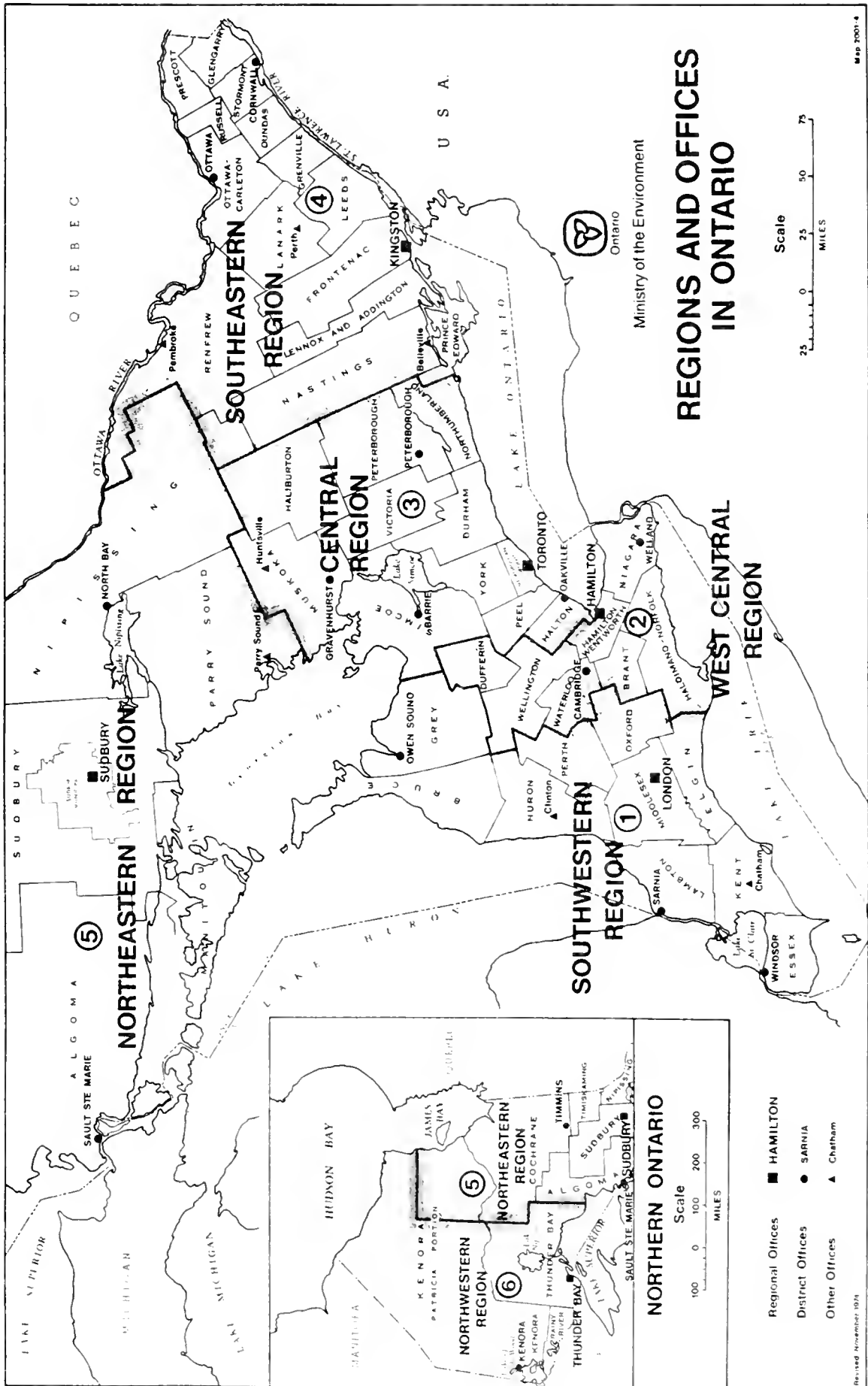
REASON CODES

(answers the question, "why it happened")

REASON FOR INCIDENT	- the primary contributing factor to the cause
01 Intentional/Planned	- intentional or planned release
02 Error	- releases due to mistakes
03 Vandalism	- illegal/deliberate releases (incl. sabotage)
04 Ice/Frost	- releases resulting from freezing, frost heave, the weight of snow/ice, or falling ice
05 Power Interruption	- releases resulting from loss of power
06 Fire/Explosion	- releases resulting from fires/explosions (not releases that cause a fire or explosion)
07 Storm/Flood	- releases resulting from storm/flood/lighting (incl. compulsory wastewater bypasses due to high flows)
08 Earthquake, slide	- releases resulting from NATURAL earth movements
09 Subsidence	- release through settling of disturbed soils
10 Equipment Failure	- malfunctions in system components (e.g. brakes valves)
11 Weld/Seam Failure	- releases from point where material is joined to form the wall of a pipe/tank or other vessel
12 Overstress/Overpressure	- any form of overloading wherein the design strength of container was exceeded
13 Corrosion	- includes all forms of corrosion (internal/external)
14 Material Failure	- poor design or substandard materials
15 Damage by Moving Equipment	- containers damaged by vehicles
16 Gasket/Joint	- any point of connection (except reason 11)
17 Negligence (Apparent)	- release due to lack of diligence
18 Adverse Road Condition	- road faults, ice/snow, material on road
19 Combustion Problems	- stack emissions due to poor burning conditions
97 Careless Application	- misuse of pesticides, fertilizers, sludge
98 Unknown	- primary reason for release not determined
99 Other	- primary reason for release not otherwise defined

II - 8
MINISTRY DISTRICT CODE TABLE

<u>MINISTRY REGION</u>	<u>DISTRICT CODE</u>	<u>DISTRICT</u>
Southwest	LD	London
	OS	Owen Sound
	SR	Sarnia
	WD	Windsor
<hr/>		
West Central	CA	Cambridge
	HA	Hamilton
	WL	Welland
<hr/>		
Central	BA	Barrie
	MH	Muskoka/Haliburton
	OA	Oakville
	PT	Peterborough
	TE	Toronto East
	TW	Toronto West
	YD	York Durham
<hr/>		
Southeast	BV	Belleville
	CW	Cornwall
	KG	Kingston
	OT	Ottawa
	PM	Pembroke
<hr/>		
Northeast	NB	North Bay
	PA	Parry Sound
	SD	Sudbury
	SM	Sault Ste. Marie
	TI	Timmins
<hr/>		
Northwest	KN	Kenora
	TB	Thunder Bay

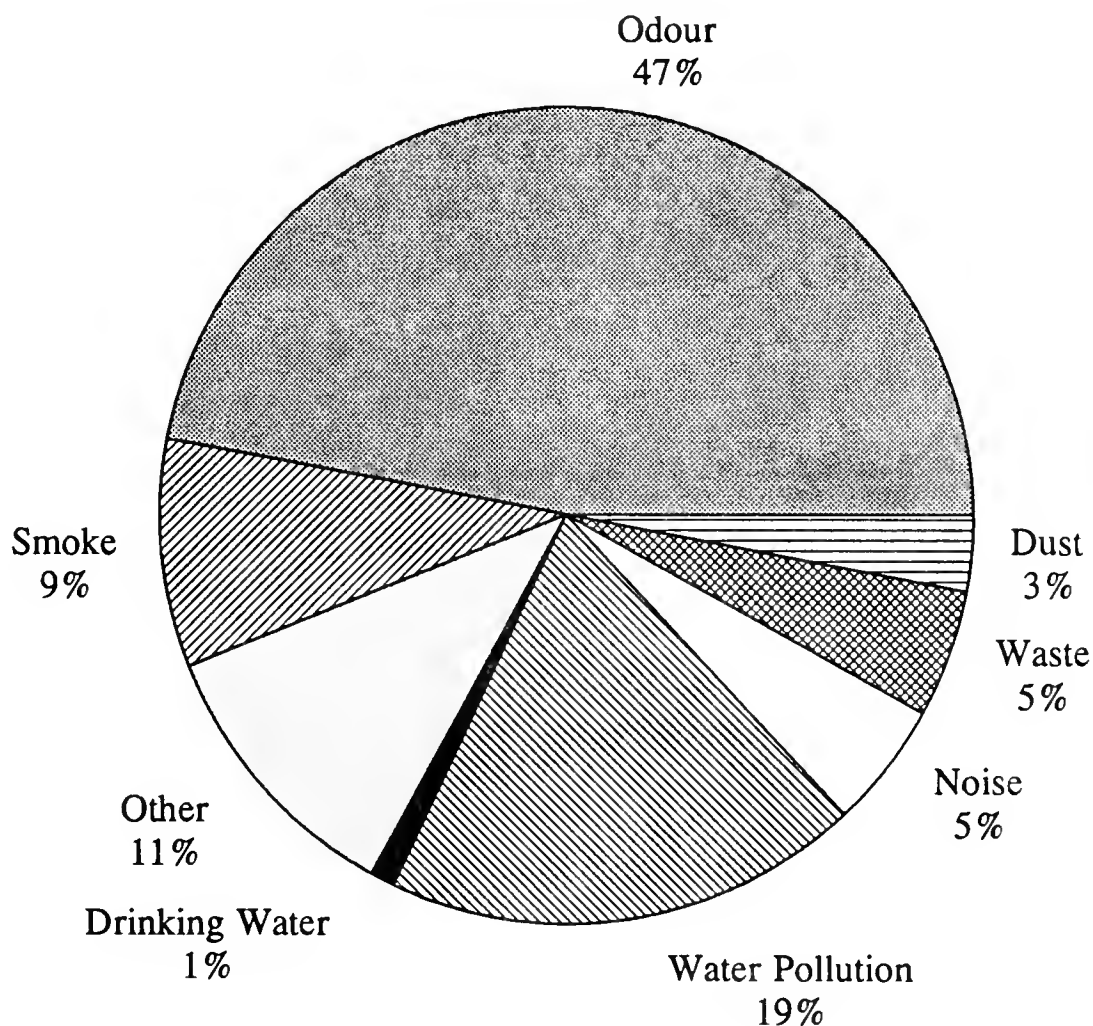


APPENDIX III

COMPLAINTS BY TYPE

Appendix III

Complaints* By Type



* A total of 4068 Complaints were reported to SAC in 1990.
This total does not include Complaints reported directly
to the Ministry's District and Regional Offices

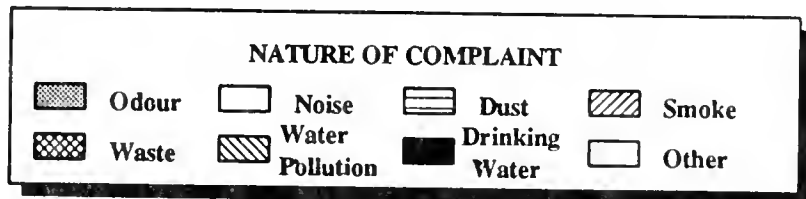
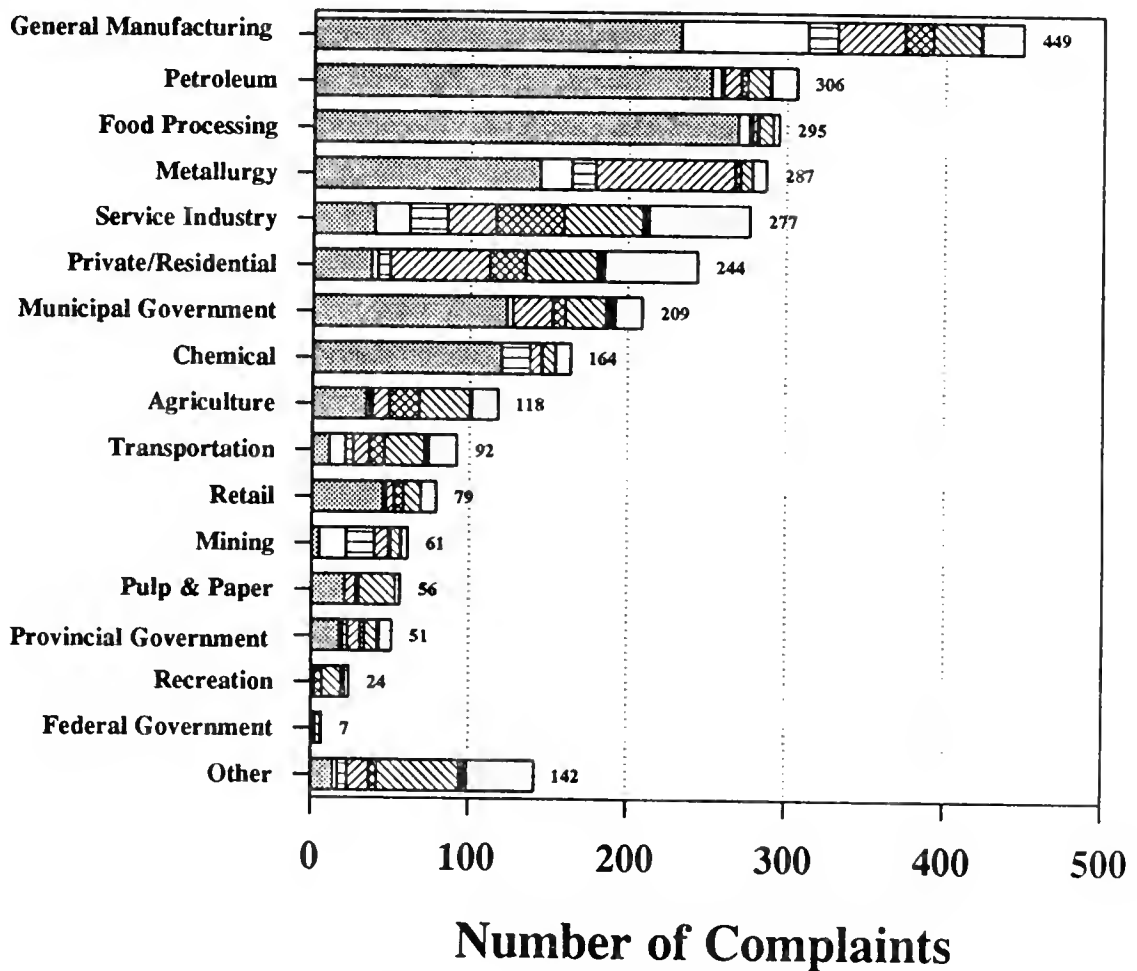
APPENDIX IV

COMPLAINTS BY TYPE AND SECTOR

Appendix IV

Complaints* By Type & Sector

Sector **



* Only includes complaints reported directly to SAC

** Sector was not known for 1207 complaints

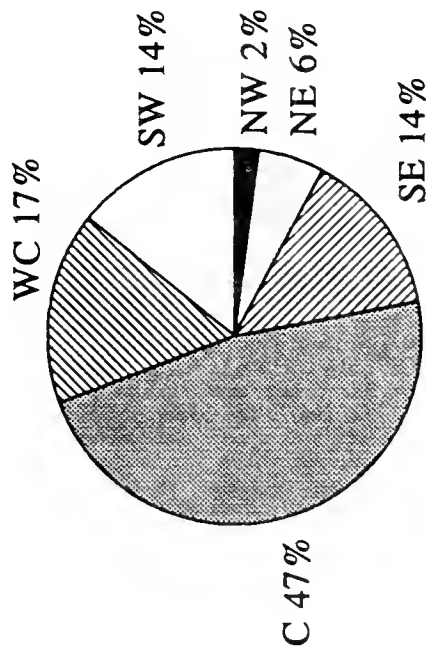
APPENDIX V

POPULATION vs. COMPLAINTS BY MOE REGION

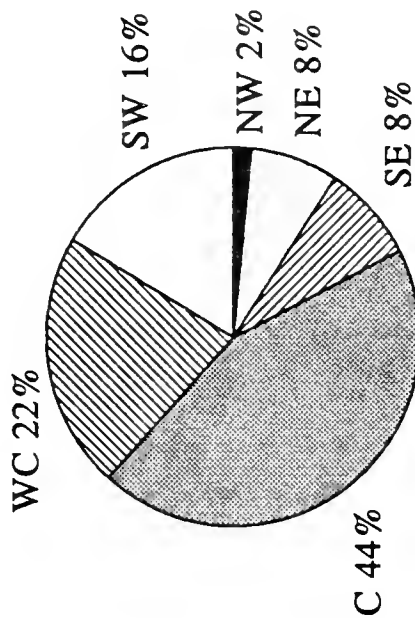
Appendix V

Population vs. Complaints*

By MOE Region



Population
Distribution



Complaint
Distribution

* Only includes complaints reported directly to SAC
Population statistics derived from 1988
Ministry of Revenue enumeration data.

APPENDIX VI

SPILLS BY SECTOR AND SOURCE

APPENDIX VI SPILLS BY SECTOR AND SOURCE

SOURCE	SECTOR																		TOTAL
	AG	CH	FD	FO	GF	GM	GN	GP	ME	MN	PE	PP	RE	RS	RT	SI	TA	UK	
AC				3	2			2						5			10		22
BC																	14		14
HP						1		131								9			141
HR											2					2	2		6
HT																	15		15
HV	8	5	4	8		52	8	72	1	3	4	2	1	136		61	116	93	574
OP	2	543	56				208		442	18	7	211				4		1	1492
OS	22	6	1		8	25	29	28	2	11	36	2	4	214	20	54	36		498
OT	37	5	3		12	24	11	55	1	7	3		4	51	15	93	8	9	338
OW								1			1		1			3	30		36
PC														26					26
PF										37	4								41
PL											33								33
RF											79								79
SD	3	4			1	4	2	4			125	1			3	6	14		167
SS										1	275		1		23	10			310
ST					1	124	1	133	20	10			1	15		2			307
SW		1				29		10	3	7						2	3		55
TF		2				161		232	1	1				8		1			406
TP	3	29	13	2	2	1	9	8	3	2	2	4		1	3	20	284		386
TR		4						1									58		63
TT	9	15	5		1	1	3	1	3	3	141		1		4	21	244		452
UK																		188	188
WD		1				2				1						22			26
WS						7		2						2					11
TOTAL	84	615	82	13	27	431	271	680	476	101	712	220	13	458	68	310	834	291	5686

*See Appendix II for description of Source and Sector Codes

SECTOR	SOURCE
AG Agriculture	AC Aircraft
CH Chemical	BC Bulk Marine Carrier
FD Food Processing	MT Marine Tanker
FO Forestry	MR Marine Terminal
Government GM (Municipal)	PC Pleasure Craft
GP (Provincial)	OW Other Watercraft
GF (Federal)	TR Train/Railroad
GN General Manufacturing	TT Tank Truck
ME Metallurgy	TP Transport Truck
MN Mining	MV Motor Vehicle
PE Petroleum	PF Production Field
PP Pulp & Paper	PL Pipeline
RE Recreation	RF Petroleum Refinery
RS Residential/Private	SD Storage Depot
RT Retail	SS Service Station
SI Service Industry	OS Other Storage Facility
TA Transportation	HP Heat/Power Plant
OT Other	OP (Other) Plant
UK Unknown	ST Sewage Treatment
	SW Sewer
	TF Transformer
	WD Waste Disposal
	WS Water Supply
	OT Other
	UK Unknown

* See Appendix II for a complete Description of these Codes.

APPENDIX VII

SPILLS BY CAUSE AND REASON

APPENDIX VII SPILLS BY CAUSE AND REASON

REASON	CAUSE																							TOTALS
	C1	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	98	99	
01				5							2			27	38		17			2	40	1	58	190
02		2		8	3	1	59	81	334	95	73		8	179	31		22		10	17		5	57	985
03				1					1	8	6			42	3				3	12		1	17	94
04									1	7	5		1	7	1			1	3	3			2	31
05									11	1	3				75		24	4	2		13			133
06			1					4		3		1	1	24	1		15	25	3			7	25	110
07		1	2						21					14	23			1	66	2		3	12	145
08														2	1									3
09					1					2				1				3						7
10			1			1	3	12	169	237	190	1	15	183	125	1	149	135	27	52	2	24		1327
11										33	11		4	29				17	8					132
12									22	130	23	1	4	18	9		23	1	39	2		1	2	275
13										29	4		110	66				1	7	47				264
14										69	18		6	32			8	2	9	8			1	153
15								25		35	5		6	89				1	69	6		1	2	239
16										27	34		2	10	1		3		11	3				91
17				2					46	15	9		5	52	19		2		1	7		1	29	189
18							40	50		7				19										116
19																	27				11	1	1	40
97															7								8	15
98			4	7	5	4	20	34	38	77	24	1	30	253	29	1	21	6	29	35	7	309	16	950
99			1		1		3	7	29	28	12		5	39	24	1	12	1	13	7	11	2	32	228
TOTALS	0	3	9	23	10	6	125	213	672	803	419	4	197	1086	387	3	323	17	441	191	134	334	286	5586

*See Appendix 11 for description of Cause and Reason Codes

CAUSE		REASON	
01	Collision (Watercraft)	01	Intentional/Planned
02	Grounding (Watercraft)	02	Error
03	Sinking Watercraft	03	Vandalism
04	Ship's Tank/Bilge Pumping	04	Ice/Frost
05	Derailment	05	Power Interruption
06	Crash (Aircraft)	06	Fire/Explosion
07	Overturn (Truck/Trailer)	07	Storm/Flood
08	Other Transport Accident	08	Earthquake, slide
09	Overflow (Tanks, Lagoons)	09	Subsidence
10	Pipe and Hose Leak	10	Equipment Failure
11	Valve/Fitting Leak/Failure	11	Weld/Seam Failure
12	Bladder Leak	12	Overstress/Overpressure
13	Tank Leak (Underground)	13	Corrosion
14	Container Leak, Fuel Tanks, Barrels	14	Material Failure
15	Discharge/Bypass to Watercourse	15	Damage by Moving Equipment
16	Well Blowout (Oil and Gas)	16	Gasket/Joint
17	Process Upset	17	Negligence (Apparent)
18	Dyke failure (Lagoons, Ponds)	18	Adverse Road Condition
19	Cooling System Leak	19	Combustion Problems
20	Tank Leak (Surface)	97	Careless Application
21	Start Ups/Shutdowns/Interruptions	98	Unknown
98	Unknown	99	Other
99	Other Discharges		

* See Appendix II for a complete Description of these Codes.

